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PESTICIDES in SOIL and WATER
an annotated bibliography

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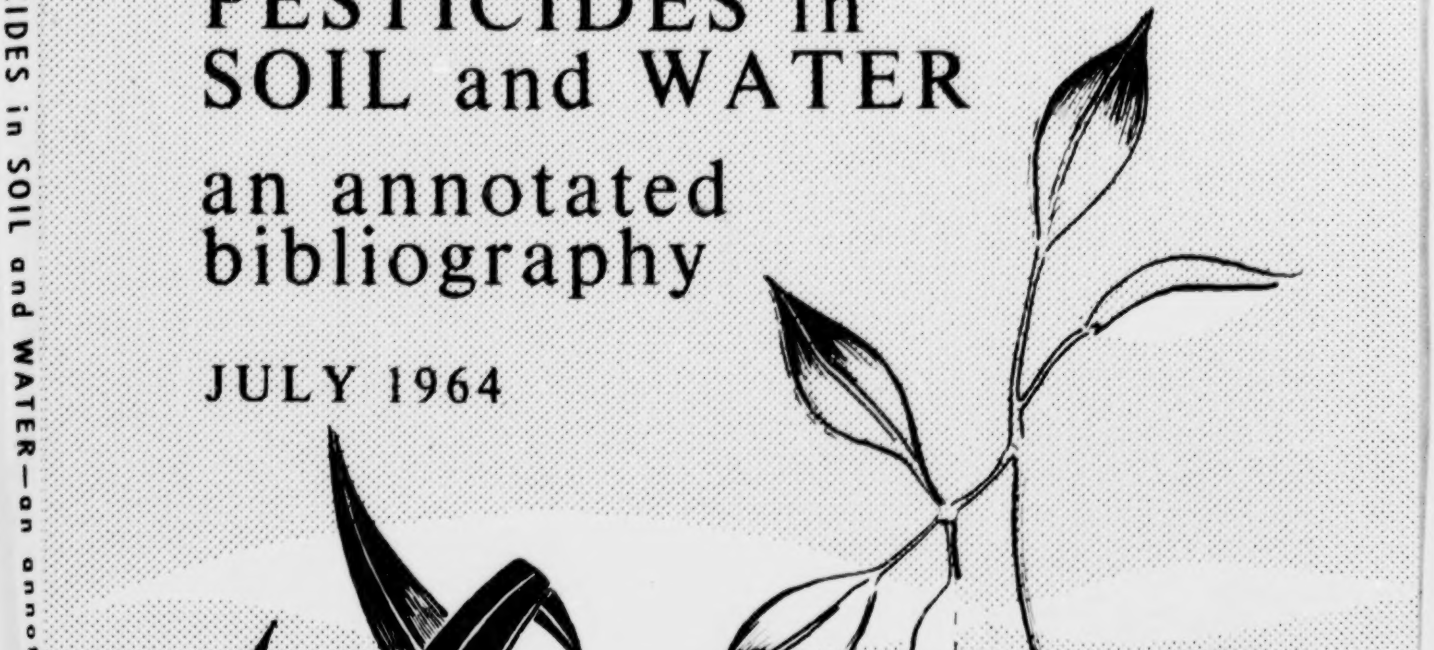

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service

PESTICIDES in SOIL and WATER—an annotated bibliography—July 1964 999-WP-17

PESTICIDES
IN
SOIL AND WATER

AN ANNOTATED BIBLIOGRAPHY

Engineering Section
Basic and Applied Sciences Branch
Robert A. Taft Sanitary Engineering Center

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Division of Water Supply and Pollution Control
Cincinnati, Ohio

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Public Health Service Publication No. 999-WP-17

FOREWORD

The worldwide use of pesticides has substantially increased since the development of DDT and other chlorinated hydrocarbons in the 1940's. Although the use of pesticides has promoted health through control of vector-borne diseases and has improved agricultural production, there is increasing evidence of environmental contamination by the chemicals. The extensive use of such chemicals implies a potential hazard that must be evaluated.

The medical and agricultural usefulness of pesticides has been ably reviewed. This annotated bibliography is a review of the literature that falls within the interest of the land drainage and water treatment projects of the Engineering Section. Its scope embraces the following subjects:

1. Water solubility, taste and odor, and volatility of specific compounds.
2. The occurrence, adsorption, and persistence of residues in soils.
3. The occurrence and persistence of residues in ground water and surface water.
4. Physical, chemical, and biochemical processes that lead to dissipation or degradation of residues.
5. The treatment of manufacturing plant wastes.
6. Detection and determination of pesticide residues in water.

The annotations were prepared with this scope in mind and do not indicate the entire content on many of the included articles. The references are arranged chronologically from 1944 through 1963 and alphabetically by author within years.

The subject index and pesticide name index are included to facilitate use of an otherwise unwieldy publication. The subject index is consistent with the six subjects listed previously and does not incorporate the total content of the references. The pesticide name index contains a cross-reference of common names and chemical formulae of pesticides mentioned.

This annotated bibliography was compiled by Mr. Richard E. Thomas, Soil Scientist; Mr. Jesse M. Cohen, Supervisory Chemist; and Mr. Thomas W. Bendixen, Soil Scientist, all of the Engineering Section, Basic and Applied Sciences Branch, Division of Water Supply and Pollution Control, U. S. Public Health Service. Copies may be obtained from Chief, Engineering Section, Basic and Applied Sciences Branch, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, 45226.

Gordon G. Robeck

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ANNOTATED BIBLIOGRAPHY

1944-1946

1. **Fleck, E. E.** Rate of Evaporation of DDT. *J. Econ. Entomol., 37:853 (1944).* The evaporation rate of 63.36 mg of DDT from a glass plate in an air bath at 45°C declined from an initial rate of 0.34 mg/day to 0.05 mg/day on the 37th day. The DDT evaporation rate was not affected by changes in the air flow through the chamber within the limits of 5 to 20 l/hr.

2. **Fleck, E. E., and Haller, H. L.** Catalytic Removal of Hydrogen Chloride from Some Substituted Alpha Trichloroethanes. *J. Am. Chem. Soc., 66:2095 (1944).* Anhydrous ferric and aluminum chlorides, iron, iron oxides, and fuller's earth catalytically remove HC1 from DDT. An example of the rate of reaction is as follows: two g of DDT with 2 mg of anhydrous ferric chloride catalyst reacted at 110° to 120°C yields 99 % of the theoretical HC1 in 15 minutes.

3. **Carollo, J. A.** The Removal of DDT from Water Supplies. *J. Am. Water Works Assoc., 37:1310 (1945).* DDT rates of 0.1 and 0.0015 ppm applied to water lost toxicity to A. *aegypti* larvae in 10 to 12 days, and 48 hours, respectively. Turbidity in the water had little effect on the 48-hour larvae kill, but upon settling out, it reduced the DDT concentration in the water. Conventional water treatment processes involving coagulation, sedimentation, and filtration remove 80 to 98% of 0.1 to 10.0 ppm applications of DDT. Removal to less than 0.001 ppm of DDT is possible with activated carbon treatment after coagulation and sedimentation and before filtration.

4. **Slade, R. E.** The Gamma Isomer of Hexachlorocyclohexane (Gammexane). *Chemistry & Industry, 40:314 (1945).* The pure gamma isomer of BHC is colorless, practically odorless and tasteless, and melts at 112.5°C. Its water solubility is 10 ppm, and it is very stable in natural waters. Although gamma BHC exhibits considerable chemical stability, it undergoes dehydrochlorination at 60°C and room temperature in alkalis such as lime water.

5. **DeRose, H. R.** Persistence of Some Plant Growth-Regulators When Applied to the Soil in Herbicidal Treatments. *Botan. Gaz., 107:583 (1946).* An application of 1 mg of 2,4-D per 25 g soil was nontoxic to tomato plants after the soil had been leached with 4.5 inches of water. Tomato plants in soil with controlled high moisture to which 12 mg of 2,4-D per lb had been applied were nontoxic after standing in the greenhouse for 8 weeks. Normal 2,4-D and IPC application retained phytotoxicity to soybeans for not more than 80 and 60 days, respectively, in field studies. MCPA at 50 lb/acre retained phytotoxicity to soybeans for more than 68 days in a field study. At 10 and 20 lb/acre rates 2,4,5-T retained herbicidal activity longer than 2,4-D.

6. **Hanks, R. W.** Removal of 2,4-Dichlorophenoxyacetic Acid and Its Calcium Salt from Six Different Soils by Leaching. *Botan. Gaz., 108:186 (1946). C. A., 41, 1789g.* 2,4-D disappeared most rapidly from a peat soil and was resistant to leaching from alkali soil.

7. **Martin, J. P.** The Hormone Weed Killer 2,4-D. *Calif. Citrograph, 31 :264 (1946). C. A., 40, 44717.*^{7} 2,4-D is more strongly adsorbed by acid soil than by alkali soil. It is slowly decomposed by soil microbes, and in low concentrations it does not affect soil microbes. It is more toxic under acid than under alkaline conditions.

8. **Richards, A. G., and Cutkomp, L. K.** Correlation Between the Possession of a Chitinous Cuticle and Sensitivity to DDT. *Biol. Bull., 90:97 (1946).* The water solubility of DDT is between 0.2 and 1.0 ppb.

9. **Roeder, K. D., and Weiant, E. A.** The Site of Action of DDT in the Cockroach. *Science, 103:304 (1946).* Biological studies with the cockroach indicate that the water solubility of DDT is 0.01 to 0.1 ppm.

10. **Wichmann, H. J., Patterson, W. I., Clifford, P. A., Klein, A. K., and Claborn, H. V.** Decomposition and Volatility of DDT and Some of Its Derivatives. *J. Assoc. Offic. Agr. Chemists, 29:218 (1946).* Laboratory study of the effect of UV irradiation on DDT and DDE shows that both compounds undergo chemical changes when exposed at 35°C. DDE is less stable than DDT and one of the decomposition products contains considerable labile chlorine. DDT is less volatile than several of its decomposition products. These DDT decomposition products may volatilize completely under field conditions.

1947-1948-1949

11. **Balson, E. W.** Vapor Pressure Measurement. III. An Effusion Manometer Sensitive to 5×10^{-6} Millimeters of Mercury; Vapor Pressure of DDT and Other Slightly Volatile Substances. *Trans. Faraday Soc., 43:54 (1947).* Vapor pressures of several compounds can be determined as follows:

$$\log_{10} P = A - \frac{B}{T}$$

where $P =$ mm Hg and $T =$ °K.

Compound	A	B	Temperature, °C
DDT	14.191	6160	66-100
Alpha BHC	11.950	4850	51-71
Gamma BHC	15.515	6020	60-92
3,5 Dinitro-o-cresol	14.140	5400	17-51

12. **Hixson, E., and Muma, M. H.** Effect of Benzene Hexachloride on the Flavor of Poultry Meat. *Science, 106:422 (1947).* BHC produced taste and odor in processed meat when sprayed on the poultry or the interior of the poultry house, or when mixed with the feed.

13. **Lucas, E. H., and Hammer, C. L.** Inactivation of 2,4-D by Adsorption on Charcoal. *Science, 105:340 (1947).* Aqueous solutions of the Na salt of 2,4-D in concentrations of 1,000 to 10,000 ppm are inactivated by 1 to 10% suspensions of charcoal (Norit A).

14. **Ready, D., and Grant, V. Q.** A Rapid Sensitive Method for Determination of Low Concentrations of 2,4-Dichlorophenoxyacetic Acid in Aqueous Solutions. *Botan. Gaz., 109:39 (1947).* The germinating cucumber seed bioassay procedure described for the determination of 2,4-D in water has a sensitivity of 0.005 ppm and a working range of 0.005 to 5.0 ppm.

15. **Weaver, R. J.** Reaction of Certain Plant-Growth Regulators with Ion Exchangers. *Botan. Gaz., 109:72 (1947).* Adsorption of several 2,4-D derivatives on several ion exchange resins was reported. In general cation exchangers on the H cycle adsorbed considerable 2,4-D whereas the same exchangers on the Ca or Na cycle adsorbed little, if any. Anion exchangers adsorbed widely varying amounts of 2,4-D. 2,4-D adsorption by cation exchangers was inversely related to pH. Plant growth in treated exchangers showed that adsorption reduced phytotoxicity of 2,4-D.

16. **Bowen, C. V.** A Second List of Publications on Benzene Hexachloride. *U. S. Dept. Agr., Bur. Entomol. and Plant Quarantine, E-755, 38 pp (1948).* This bibliography includes 453 references from literature published before August 1948.

17. **Davis, L. L.** Benzene Hexachloride in Processed Peaches. *Food Technol., 2:303 (1948)* A selected panel could detect the taste and odor of a BHC formulation in water at 1 and 10 ppm, respectively. Taste could also be detected in canned peaches at 1 ppm.

18. **Newman, A. S., DeRose, H. R., and DeRigo, H. T.** Persistence of Isopropyl N-Phenylcarbamate in Soils. *Soil Sci., 66:393 (1948).* Bioassay with corn, oats, and barley showed that autoclaving soil increased phytotoxic persistence from 2 weeks to 9 weeks. A saturation moisture content of the soil also increased phytotoxic persistence. Increasing temperature from 10° to 30°C at an intermediate moisture content reduced phytotoxic persistence. Phytotoxicity from a 50 lb/acre application persisted only slightly longer than that from a 10 lb/acre application.

19. **Peck, D. R.** Alkali Stability of the Insecticide E605. *Chemistry & Industry, 33:526 (1948).* Diethyl p-nitrophenyl thiophosphate (E605) is soluble in water to the extent of 15 to 20 ppm at 20° to 25°C. It undergoes rapid hydroxyl catalyzed hydrolysis in alkaline solution (half-life of 8 days in saturated lime water at 25°C) and slow uncatalyzed reaction with water in the absence of alkali (half-life of 120 days at 25°C).

20. Sayre, A. N., and Stringfield, V. T. Artificial Recharge of Ground Water Reservoirs. *J. Am. Water Works Assoc., 40:1152 (1948).* Phenols detected in the ground water were traced to the waste discharged from a plant producing a weed killer containing mainly trichlorophenol. The phenols were detected within 17 days of the time that the plant began discharging waste to the city's activated-sludge sewage treatment plant, which discharged its chlorinated effluent to the Rio Hondo. The waste percolated down through the Rio Hondo riverbed to the ground water basin. This short-time discharge of waste caused taste and odor that was evident 4-1/2 to 5 years afterward.

21. Smith, M. S. Persistence of DDT and BHC in Soils. *Ann. Appl. Biol., 35:494 (1948). C. A., 43, 9343f.* DDT and BHC are very stable in soils. About 95% of the former and 80% of the latter were recoverable after 18 months. DDT and BHC were determined by chemical analysis for organic chlorine.

22. Weaver, R. J. Some Uses of Activated Carbon in Contratoxification of Plant Growth Regulators. *Botan. Gaz., 110:300 (1948).* Norit A, an activated carbon, has a high adsorption capacity for the ammonium salt of 2,4-D.

23. Bailey, J. S., Esselen, W. B., Jr., and Wheeler, E. H. Off-Flavors in Peaches Sprayed with Benzene Hexachloride. *J. Econ. Entomol., 42:774 (1949).* Spraying peaches with 6% gamma BHC as a 50% wettable powder at the rate of 2 lb/100 gal caused no off-flavor in frozen or fresh fruit, but it did cause detectable off-flavor in the canned fruit for 32 of 36 varieties tested.

24. Fleck, E. E. The Action of Ultraviolet Light on DDT. *J. Am. Chem. Soc., 71:1034 (1949).* UV light catalyzes the degradation of DDT in aerobic and anaerobic environments. In air the product is 4,4'-dichlorobenzophenone and in the absence of air the product is 2,3-dichloro-1,1,4,4, - tetra kis (p-chlorophenyl) - 2 butene. A 360-watt Uviarc lamp 25 cm above the sample at 35° to 40°C produced 10% conversion of a 1 g sample in air and 40% conversion of a 1 g sample in the absence of air after 40 hours of irradiation.

25. Greenwood, Mary L., and Tice, Jean Marie. Palatability Tests on Potatoes Grown in Soil Treated with the Insecticides Benzene Hexachloride, Chlordane, and Chlorinated Camphene. *J. Agr. Res., 98:477 (1949).* Off-flavor in cooked potatoes was detected as the result of 1 lb/acre or greater applications of BHC. There was no conclusive evidence for off-flavor from the use of chlordane or chlorinated camphene.

26. Kuhn, W., and Massini, P. The Relation of Temperature to Vapor Pressure and Rate of Evaporation of DDT. *Helv. Chim. Acta, 32:1530 (1949). Biol. Abstr., 24, 16861.* The vapor pressure of DDT can be calculated as follows:

$$\log_{10} P_s = 9.6 - \frac{4370}{T}$$

where P_s = mm Hg and T^s=°K.
The evaporation rate is 10^7 times less than expected from the saturation pressure because the accomodation coefficient varies only slightly with temperature. The molecular heat of evaporation is approximately 20,000 cal/mole at 70°C.

27. **Lehrer, W. P., Jr., Barr, W. F., and Morris, H. C.** Odor and Taste Tests of Pork from Animals Sprayed with Benzene Hexachloride. *J. Animal. Sci., 8:141 (1949).* Spraying animal at least 2 weeks before slaughter did not produce taste or odor in the processed meat.

28. **Smith, C. F., Jones, I. D., and Rigney, J. A.** Effect of Insecticides on the Flavor of Peaches - 1948. *J. Econ. Entomol., 42:618 (1949).* A 10% gamma isomer BHC formulation caused detectable changes in fruit flavor except when applied in petal-fall and shuck-off stages of development. Chlordane, toxaphene, and parathion caused no detectable flavor changes in the fruit.

1950

29. **Bright, N. F. H., Cuthill, J. C., and Woodbury, N. H.** The Vapor Pressure of Parathion and Related Compounds. *J. Sci. Food Agr., 1:344 (1950).* The vapor pressures of pure parathion and a number of related compounds were measured at various temperatures in the range 25° to 92°C. Vapor pressures have been shown to be low at ordinary temperature, generally of the order of 10^{-4} mm Hg or lower at 20°C.

30. **Cochran, J. H., and Van Blaricom, L. O.** Insecticides vs. Flavor. *Food Packer, 31:30 (1950).* BHC sprays applied as much as 92 days before harvest caused off-flavor in canned peaches whereas only late sprays affected the fresh fruit. Parathion residues ranging up to 0.04 ppm in canned peaches and up to 1.5 ppm in the peel of fresh fruit caused no off-flavors. Normal applications of chlordane also did not cause off-flavors.

31. **Griffiths, J. T., Jr., Reitz, H. J., and Olsen, R. W.** Off-Flavor Produced in Florida Orange Juice After Application of New Organic Insecticides. *Agric. Chemicals, 5:41 (1950).* A commercial BHC imparted musty flavor to orange juice when sprayed on the trees during fruiting. High gamma BHC affected flavor when sprayed with oil, but it had no effect when formulated as a wettable powder.

32. **Hernandez, T. P., and Warren, G. F.** Some Factors Affecting the Rate of Inactivation and Leaching of 2,4-D in Different Soils. *Proc. Am. Soc. Hort. Sci., 56:287 (1950).* 2,4-D was rapidly inactivated under soil conditions favoring activity of microorganisms. High

organic matter content in soil reduced the movement of 2,4-D by leaching.

33. **Knoppien, P.** Experiments on Flavor After Application of Insecticides Containing Hexachlorocyclohexane (BHC). *Mededel. Directeur Tuinbouw, 13:771 (1950). Biol. Abstr., 25, 21737.* With Yellow Transparent and Pomme de Coeur apples and with Czar plums, hardly any tainting was experienced when BHC was applied on June 8. Spraying on July 23, either with bentox or hexyclan gave an annoying musty flavor to Pomme de Coeur. The flavor was more adversely affected by hexyclan than by bentox. The flavor of Bell de Boskap was badly affected by a spray containing 1% bentox applied on June 11.

34. **Loustalot, A. J., and Ferrer, R.** The Effect of Some Environmental Factors on the Persistence of Sodium Pentachlorophenate in the Soil. *Proc. Am. Soc. Hort. Sci., 56:294 (1950).* Phytotoxicity persistence was inversely related to temperature and moisture of the soil and was greater for soils with a higher clay content.

35. **Loustalot, A. J., and Ferrer, R.** Studies on the Persistence and Movement of Sodium Trichloroacetate in the Soil. *Agron. J., 42:323 (1950).* Greenhouse studies with soil flats indicate that decline of phytotoxicity in soil was positively correlated to temperature and moisture content of the soil. Toxicity generally declined rapidly with rates of application up to 90 lb/acre being detoxified in less than 2 months under favorable conditions. Simulated rainfall of 1 inch carried TCA to a depth of at least 8 inches. The toxicity of TCA persisted longer in clay soil than in sandy or sandy-clay soils.

36. **McNew, G. L., and Hoffmann, O. L.** Growth-Regulant, Herbicidal, and Physical Properties of 2,4-D and Related Compounds. *Iowa State Coll. J. Sci., 24:189 (1950).* Water solubility and melting point of 2,4-D and 18 derivatives are presented. Solubilities of 2,4-D formulations in water range from 0.04 g/100 ml for 2,4-D acid to 710 g/100 ml for the diallylamine salt of 2,4-D.

37. **Munchberg, P.** The Probable Causes of the Influence of Treatment with Hexa Preparations on the Odor and Taste of Harvested Crops. *Z. Hyg. Zool. Schadlingsbekampf, 38:136 (1950). C.A., 46, 11543i.* It is highly probable that the unpleasant, penetrating, pungent odor of crude Hexa preparations is due to the presence of 1,2,4,5, tetra and 1,2,3,4,5 penta-chloro-benzene, whereas the earthy musty odor is due to highly chlorinated cyclohexane derivatives.

38. **Newman, A. S., and Thomas, J. R.** Decomposition of 2,4-Dichlorophenoxyacetic Acid in Soil and Liquid Media. *Soil Sci. Soc. Amer. Proc., 14:160 (1950).* Persistence of 2,4-D in soil at applications of 2.5, 10, and 50 mg/lb was 8, 11, and 21 days, respectively. Upon retreatment with a uniform application of 10 mg/lb persistence was reduced to 6 to 7 days. Mixed cultures isolated from soils previously treated with 2,4-D decomposed 2,4-D in a liquid medium more rapidly than mixed cultures isolated from soils not previously treated with 2,4-D.

39. Norman, A. G., and Newman, A. S. The Persistence of Herbicides in Soils. *Proc. Northeast Weed Control Conf., 4:7 (1950).* 2,4-D as the acid or in ester form is sufficiently water soluble to be easily leached from soil. It is decomposed by the natural microbial population and subsequent increments are decomposed more rapidly than the first.

40. Roark, R. C. A Digest of Information on Toxaphene. *U. S. Dept. Agr., Bur. Entomol. and Plant Quarantine, E-802 (1950).* This bibliography includes 334 references pertaining to research studies on toxaphene.

41. Rodriquez, J. G., Neiswander, R. B., and Gould, W. A. Effect of Technical Benzene Hexachloride and Lindane on the Flavor of Tomatoes and Potatoes. *J. Econ. Entomol., 43:498 (1950).* Treatment rates of 2 lb/acre of toxicant were applied to the soil or spray mixed to give 3 oz of gamma isomer per 1,000 gal of water. The technical BHC residues of 0.6 ppm for tomatoes and 0.7 ppm for potatoes produced off-flavor, whereas the lindane residues of 0.1 ppm for tomatoes and 0.3 ppm for potatoes produced slight or negligible off-flavor.

42. Smith, C. F., Jones, I. D., and Calvin, L. D. Effect of Insecticides on the Flavor of Peaches - 1949. *J. Econ. Entomol., 43:179 (1950).* A continuation of previously reported studies (abstract 28) indicates that although statistically significant flavor changes were associated with parathion-sulfur sprays, lead arsenate-sulfur sprays, and BHC-sulfur sprays, they would not affect consumer purchasing of peaches.

1951

43. Akamine, E. K. Persistence of 2,4-D in Hawaiian Soils. *Botan. Gaz., 112:312 (1951).* 2,4-D applied at the rate of 10 lb/acre as a surface dust lost its phytotoxicity in 2 to 14 weeks. The relative persistence in different soils was not correlated with the organic-matter content, fertility, or adsorptive capacity of the soils.

44. Chisholm, R. D. DDT Residues in Soil. *J. Econ. Entomol., 43:941 (1951).* Soil residue analysis after 1 to 5 years of annual DDT applications in apple and peach orchards showed accumulation of DDT residues under the trees.

45. Gould, W. A., Sleesman, J. P., Rings, R. W., Lynn, F., and Brown, H. O. Flavor Evaluations of Canned Fruits and Vegetables

Treated with Newer Organic Insecticides. *Food Technol., 5:129 (1951).* The effect of several insecticides on the flavor of many crops was evaluated. All BHC formulations caused off-flavors whereas chlordane, parathion, DDT, rhothane, and toxaphene imparted off-flavor to certain crops under some conditions. The detectable taste threshold concentration of BHC in water increased from 0.01 ppm for a 6% gamma formulation to > 1,000 ppm for the recrystallized 99% gamma isomer.

46. Kasting, R., and Woodward, J. C. Persistence and Toxicity of Parathion When Added to the Soil. *Sci. Agr. (Ottawa), 31:133 (1951).* There was no gross effect on soil microflora with treatment up to 100 lb of parathion per acre. Soil residues declined to a nondetectable level after 16 days for the 2 lb/acre treatment while the 100 lb/acre treatment had declined to 2.4 lb/acre at 165 days.

47. King, L. J., and Kramer, J. A., Jr. Studies on the Herbicidal Properties and Volatility of Some Polyethylene and Polypropylene Glycol Esters of 2,4-D and 2,4,5-T. *Contrib. Boyce Thompson Inst. 16:267 (1951).* Bioassay procedures were used to show the relatively low volatility of polyethylene glycol esters of 2,4-D and 2,4,5-T.

48. LePage, H. S., and Giannotti, O. Research on BHC. The Pure Gamma Isomer of BHC and Its Application as Insecticide. *Biologico (Sao Paulo), 17:41 (1951). Biol. Abstr., 26, 2254.* The disagreeable musty odor is suppressed and off-flavor is eliminated when the gamma isomer is used.

49. Minarik, C. E. Pre-emergence Herbicides and Their Behavior. *Proc. Northeast Weed Control Conf. (Supp.), 5:29 (1951).* The water solubility of several 2,4-D formulations in g/l are 2,4-D acid, 0.5; Ca salt, 2.5; Mg salt, 17.4; K salt, ≈ 30; Na salt, ≈ 30; NH_4 salt, ≈ 30; and alkanolamine, ≈ 300.

50. Munchberg, P. The Chemistry and Pysiology of the Odor and Taste Carriers of Technical Hexachlorocyclohexane. *Nachrbl. deut. Pflanzenschutzdienst, 3:168 (1951). C. A., 50, 13355f.* Epsilon $C_6H_6Cl_6$ and especially delta $C_6H_6Cl_6$ and gamma $C_6H_5Cl_7$ are taste producers whereas gamma $C_6H_5Cl_7$ is the important odor producer in BHC.

51. Muzik, T. J., Loustalot, A. J., and Cruzado, H. J. Movement of 2,4-D in Soil. *Agron. J., 43:149 (1951).* 2,4-D applied as the sodium salt is not translocated deeper than 1 inch in silty-clay loam soil when application is followed by simulated rainfall of up to 1 inch.

52. Siegel, J. J., Erickson, A. E., and Turk, L. M. Diffusion Characteristics of 1,3-Dichloropropene and 1,2-Dibromoethane in Soils. *Soil Sci., 72:333 (1951).* With air as a replacing gas, sorption by clay is reversible whereas sorption by organic matter is nonreversible. With radio tracer technique, diffusion was found to be lateral and downward from the injection point at the moisture equivalent and in air-dried soil.

53. Williams, E. F. Properties of O,O-Diethyl-O-p-Nitrophenyl Thiophosphate and O,O-Diethyl-O-p-Nitrophenyl Phosphates. *Ind. Eng. Chem., 43:950 (1951).* Physical and chemical properties of O,O-diethyl-O-p-nitrophenyl thiophosphate (I) and O,O-diethyl-O-p-nitrophenyl phosphate (II) are presented. Water solubilities are 24 mg/l and 2,400 mg/l at 25°C for I and II, respectively. Both are stable in weak acid, but are hydrolyzed by alkali. Less than 1% hydrolysis occurred in distilled water at pH 5 to 6 in a 62-day period.

54. Young, H. C., and Carroll, J. C. The Decomposition of Pentachlorophenol When Applied as a Residual Pre-Emergence Herbicide. *Agron. J., 43:504 (1951). C. A., 46, 2740i.* Pentachlorophenol (I) decomposes more rapidly in soils of high than in soils of low organic matter content. The rate of decomposition is more rapid when the moisture content of the soil is near the moisture equivalent and when temperature is favorable for microbial activity. Leaching does not appear to be an important factor in the disappearance of (I) from soil.

55. Young, L. A., and Nicholson, H. P. Stream Pollution Resulting from the Use of Organic Insecticides. *Progressive Fish-Culturist, 13:193. (1951). C. A., 46, 679e.* Fish were killed in large numbers in at least 15 streams in the Tennessee Valley of Alabama in 1950. Death of fish was traced to insecticides used for spraying or dusting cotton crops in the area. The insecticides include toxaphene, BHC, DDT, and aldrin. The kills occurred after several heavy rains. The seriousness of the leaching problem and the control difficulties are pointed out.

1952

56. Aldridge, W. N., and Davidson, A. N. The Inhibition of Erythrocyte Cholinesterase by Tri-Esters of Phosphoric Acid. *Biochem. J. (London), 51:62 (1952).* The hydrolysis rate constant for O,O-diethyl-O-p-nitrophenyl phosphate (E 600) in phosphate buffer at pH 7.6 and at 37°C is 3.9×10^{-5} min^{-1}.

57. Anderson, W. P., Linder, P. J., and Mitchell, J. W. Evaporation of Some Plant Growth Regulators and Its Possible Effect on Their Activity. *Science, 116:502 (1952).* Evaporation losses of some growth-regulating compounds during the first 24-hour period after being finely dispersed on 25 cm^2 surface area glass slides are given.

Compound	Temperature, °F	Amount applied, μg	Evaporation in 24 hr, %
3 Cl-IPC	85-88	364	91.9
IPC	85-88	382	79.6
2,4-D ethyl ester	79-90	475	29.0
Alpha naphthalenacetic acid	85-88	492	5.5
2,4-D acid	79-90	343	0
Amo 1618	79-90	4,651	0

58. Carlo, C. P., Ashdown, D., and Heller, V. G. Persistence of Parathion, Toxaphene, and Methyoxychlor in Soil. *Oklahoma Agr. Expt. Sta. Tech. Bull No. T-42, 11 pp. (1952). C. A., 46, 3707.* Insecticides were applied at the rate of 0.2 mg/g of soil to a fine sandy loam at pH's of 4.7, 6.5, and 7.8. Samples analyzed after 1,2, 4, and 8 weeks showed accelerated decomposition with decreasing pH. Persistence was toxaphene > parathion > methoxychlor, but all were still detectable after 8 weeks.

59. Chitwood, B. G. Nematocidal Action of Halogenated Hydrocarbons. *Advances in Chem. Ser., No. 7, 91 (1952).* Reported aqueous solubilities of a number of nematocidal compounds are given.

Compound	Aqueous sol., %	Compound	Aqueous sol., %
Ethylene dibromide	0.43	1,3 Dibromopropane	0.17
1,3 Dichloropropene	0.03	Ethylene chlorobromide	0.69
Chloropicrin	0.23	Nitromethane	9.5
Methyl bromide	0.09	Nitroethane	4.5
1,2 Dichloropropene	0.27	1 Nitropropane	1.4
1,3 Dichloropropane	0.29	2 Nitropropane	1.7
Carbon disulfide	0.22	1,1,2-Trichloroethane	insol.
1,1 Dichloro-1-nitroethane	0.5	Dichloropentane	insol.
Ethylene dichloride	0.87		

60. Hansen, J. R., and Buchholtz, K. P. Inactivation of 2,3-D by Riboflavin in Light. *Weeds, 1:237 (1952).* 2,4-D is completely inactivated by illumination to visible light in the presence of riboflavin. One breakdown product is suggested to be 2,4-dichlorophenol.

61. Jameson, H. R., and Peacock, F. C. Persistence of Crude Benzene Hexachloride in the Soil. *J. Sci. Food. Agr., 3:78 (1952). C. A., 46, 5767c.* BHC (13% gamma isomer), mixed with the top 6 inches of a loam soil at 8 and 24 lb/acre, dissipated at the rate of 50% per year over a 3-year period. Potato-flavor tainting occurred at and above soil residues of 0.5 lb/acre.

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62. **Jones, L. W.** Stability of DDT and Its Effect on Microbial Activities of Soil. *Soil Sci., 73:237 (1952).* Normal DDT application rates produced no injury to nitrifiers, ammonifiers, or sulfur dioxide-oxidizing microorganisms. Signs of injury began at 0.1% or greater concentration in all cases. DDT mixed with soil showed no appreciable breakdown until more than 1 year of storage. DDT breakdown was greater at lower DDT concentrations and in soils high in organic matter content.

63. **Lopatecki, L. E. and Newton, W.** The Decomposition of Dithiocarbamate, Fungicides, with Special Reference to the Volatile Products. *Can. J. Botany, 30:131 (1952).* Under slightly acid conditions, sodium diethyl dithiocarbamate produced carbon disulphide and a salt of diethylamine. The insoluble zinc and ferric salts of dimethyl dithiocarbamic acid decomposed similarly while the more stable copper salt produced no carbon disulphide. The decomposition rate for these salts was $Na^{+} > Zn^{++} > Fe^{+++} > Cu^{++}$. Under acid conditions, nabam produced hydrogen sulfide and carbon disulfide, whereas under neutral conditions, it produced only carbon disulphide, the hydrogen sulfide fraction apparently being oxidized to sulfate.

64. **Newman, A. S., Thomas, J. R., and Walker, R. L.** Disappearance of 2,4-Dichlorophenoxy Acetic Acid and 2,4,5-Trichlorophenoxyacetic Acid from Soil. *Soil Sci. Soc. Amer. Proc., 16:21 (1952).* Decomposition of 2,4-D in soil was characterized by a lag period of no decomposition followed by complete decomposition. The lag period increased from 14 days at the 0- to 6-inch depth to 42 days at the 18- to 21-inch depth. The lag period was shorter and decomposition more rapid for a second 2,4-D application made after the first was decomposed. 2,4-D persisted less than 6 weeks while 2,4,5-T persisted more than 19 weeks.

1953

65. **Aldrich, R. J.** Herbicides - Residues in Soil. *J. Agr. Food Chem., 1:257 (1953).* Herbicides are removed from soil by leaching, fixation by the soil colloids, decomposition, and volatilization. Each of these processes are discussed in separate sections.

66. **Aldridge, W. N.** The Inhibition of Erythrocyte Cholinesterase by Tri-Esters of Phosphoric Acid. 3. The Nature of the Inhibitory Process. *Biochem. J., 54:442 (1953).* Rates of hydrolysis in Sorensen's 0.0667 M phosphate buffer, pH 7.6, at 37°C were determined by detection of liberated p-nitrophenol. Some half lives for these conditions are dimethyl-p-nitrophenylphosphate, 44 hours; diethyl-p-nitrophenylphosphate, 233 hours; and diisopropyl-p-nitrophenylphosphate, more than 7,000 hours.

67. Berck, B. Micro-Determination of DDT in River Water and Suspended Solids. *Anal. Chem., 25:1253 (1953).* The described method, based on the Schecter-Haller method, has a sensitivity of 0.003 ppm.

68. Dawson, Elsie H., Gilpin, G. L., Kirkpatrick, M. E., and Weigel, C. A. Flavor and Soil Treatment. Flavor of Selected Vegetables Grown in Soil Treated with Isomers of Benzene Hexachloride. *J. Agr. Food Chem., 1:399 (1953).* The taste of a commercial high gamma isomer BHC (97.7% gamma, 1.8% alpha, 0.1% delta, 0.44% epsilon) was detected in water at 1.25 ppm by 16 members of a 25-member panel. The number of panel members able to detect pure isomers in water at 0.25 ppm was gamma, 0; alpha, 3; beta, 20; and delta, 17. The effect on flavor of vegetables varies with formulation, dosage rate, and crop.

69. Dunning, R. G. Ammonium Sulphate Recovery. *U. S. Patent, 2,610,906 (1953). C. A., 47, 1906.* DDT manufacture waste water containing 65 to 75% H_2SO_4 and 25 to 35% p-chlorobenzenesulphamic acid by weight is mixed with a saturated solution of $(NH_4)_2SO_4$. On cooling, p-chlorobenzenesulphamic acid crystallizes out. After their removal, the filtrate is neutralized with gaseous NH_3, and on cooling, $(NH_4)_2SO_4$ crystallizes out. The final effluent [a saturated solution of $(NH_4)_2SO_4$] can be used in stage one.

70. Fleming, W. E., and Maines, W. W. Persistence of DDT in Soils of the Area Infested by the Japanese Beetle. *J. Econ. Entomol., 46:445 (1953).* The average DDT in 85 soil types collected from various regions was determined for several methods of application and for a period of 8 years following treatment. The average residual DDT in soils treated at the rate of 25 lb/acre was 1 year, 97%; 2 years, 90%; 3 years, 79%; 4 years, 64%; 6 years, 56%; and 8 years, 44%. Similar losses were found with 50-lb treatments. Losses were greatest when DDT was applied as a topdressing to turf and least when mixed with the soil. DDT was most persistent in sand and least so in muck. The pH within the range of 4.0 to 7.5 seemed to have no effect. DDT was the least persistent in soils high in organic matter.

71. Fredeen, F. J. H., Arnason, A. P., and Berck, B. Adsorption of DDT on Suspended Solids in River Water and Its Role in Black-Fly Control. *Nature, 171:700 (1953).* Suspended solids in the Saskatchewan River (mainly clay and fine silt) were very effective in adsorbing DDT from the river water. DDT was applied as a 10% solution in methylated napththalene and kerosene at rates as low as 0.09 ppm for 16 minutes. Suspended solids as far as 68 miles downstream contained 0.24 to 2.26 ppm DDT.

72. Gilpin, G. L., Dawson, E. H., Geissenhainer, E. L., and Reynolds, H. Flavor of Peanuts and Peanut Products are Affected by Certain Insecticides Used in Growing Peanut Crops. *Food Technol., 7:132 (1953).* Applications of technical BHC at 1 lb gamma isomer/

acre produced off-flavor. Aldrin at 4 lb/acre, dieldrin at 2 lb/acre, and toxaphene at 25 lb/acre produced no off-flavor.

73. Ginsburg, J. M. Rate of Decomposition of the Newer Insecticides When Exposed Outdoors to Direct Sunlight. *Proc. New Jersey Mosquito Exterm. Assoc., 40:163 (1953).* All six compounds studied, DDT, dieldrin, chlordane, gamma BHC, lindane, and methoxchlor, showed some decomposition. DDT and dieldrin were the most stable whereas gamma BHC and chlordane were the least stable. DDT in kerosene was more vulnerable than DDT in fuel oil, emulsion, or wettable powder. Seven antioxidants tested did not stop decomposition of DDT.

74. Hansens, E. J. Three New Insecticides for Housefly Control in Barns. *J. Econ. Entomol., 46:372 (1953).* Pyrolan [1-phenyl, 3-methyl-pyrimidyl (6) di-methyl carbamate] has a water solubility of 0.2% at 20°C, and diazinon [O,O-diethyl-O-(2-isopropyl-4-methyl-pyrimidyl (6)] thiophosphate has a water solubility of 0.004%.

75. Hansen, W. J., and Nex, R. W. Diffusion of Ethylene Dibromide in Soils. *Soil Sci., 76:209 (1953).* Gross decomposition ranged from 9 to 91% after 172 days in different soils. Diffusion was most strongly affected by porosity. Diffusion in the gas or liquid phases could account for these results. Adsorption by soil was minimal near the wilting point. Decomposition of ethylene dibromide in soils is slow.

76. Hills, C. H., Calesnick, E. J., Dryden, E. C., and Gaspar, M. S. Ferbam Residues on Canned Montmorency Cherries. *Proc. Am. Soc. Hort. Sci., 62:261 (1953).* Ferbam spray residues on Montmorency cherries from normal spray practice have no adverse effect on color, flavor, or storage life of the canned fruit.

77. Loustalot, A. J., Muzik, T. J., and Cruzado, H. J. A Study of the Persistence of CMU in Soil. *Ag. Chemicals, 8:52 (1953).* Phytotoxicity persisted longer at 10°C than at room temperature or at 45°C, and higher application rates persisted longer. CMU persisted longer in dry than in moist soil and longer in sandy than in clayey soils. In general, factors favoring microbial action shortened length of phytotoxic period after application.

78. Majewski, F. The Treatment of Wastes at the Rohm and Haas Company. *Proc. 8th Ind. Waste Conf., Purdue Univ. Engng. Ext. Ser. No. 83, 328 (1953).* Acid insecticide waste water is passed through a bed of high-Ca limestone and treated with hypochlorite to reduce dichlorophenol concentration from 250 ppm to 0.2 ppm. Neutral waste water containing Na_2SO_4 and dichlorophenol are treated by alkaline chlorination to reduce phenol to 0.3 ppm.

79. Nasir, M. M. Stability of Contact Insecticides. IV. Relationship Between the Ultraviolet Absorption Spectrum and the Photolysis of

DDT and the Pyrethrins. *J. Sci. Food Agr., 4:374 (1953).* Decomposition of DDT and pyrethrins results from strong absorption at 2,200 to 2,400 Å. Pyrethrins are also decomposed in the 2,400 Å to visible region.

80. Nickell, L. G., and English, A. R. Effect of Maleic Hydrazide on Soil Bacteria and Other Microorganisms. *Weeds, 2:190 (1953).* Laboratory experiments demonstrated that normally recommended application rates of maleic hydrazide had no apparent harmful effects on the soil microbial population. The authors state that P. Daste, working in France, reported that maleic hydrazide was not inhibitory to soil *Azotobacter* but was strongly inhibitory to *Cytophaga.*

81. Quastel, J. H., and Scholefield, P. G. Urethanes and Soil Nitrification. *Appl. Microbiol., 1:282 (1953).* Of the series of urethanes evaluated, the most active inhibitors are ethyl-N-butyl carbamate and isopropyl carbanilate. CMU is also a powerful inhibitor of soil nitrification.

82. Reynolds, H., Gilpin, G. L., and Hornstein, I. Palatability and Chemical Studies on Peanuts Grown in Rotation with Cotton Dusted with Insecticides Containing Benzene Hexachloride. *J. Agr. Food Chem., 1:772 (1953).* A trained panel of six judges could detect off-flavor in peanut butter due to BHC at concentrations of 0.9 to 1.8 ppm in prepared reference standards mixed from a BHC-contaminated peanut butter and uncontaminated peanut butter. Peanut butter made from peanuts that were grown in a field where cotton had been treated with BHC at 3.8 or 5.14 lbs gamma isomer/acre contained 0.2 to 0.9 ppm BHC by chemical test and was rated to have off-flavor.

83. Terriere, L. C., and Ingalsbe, D. W. Translocation and Residual Action of Soil Insecticides. *J. Econ. Entomol., 46:751 (1953).* Chemical analyses 2 years after application show the following relative persistence of several insecticides: toxaphene > dieldrin > aldrin > chlordane > DDT > BHC > EPN = parathion. Bioassay shows the following relative persistence: dieldrin > aldrin > chlordane > DDT = toxaphene > BHC > EPN = parathion.

1954

84. Allen, N., Walker, R. L., Fife, L. C., Chisholm, R. D., Koblitchy, L., Bullock, J. F., Hodge, C. R., and Hall, E. E. Persistence of BHC, DDT, and Toxaphene in Soil and the Tolerance of Certain Crops to Their Residues. *U. S. Dept. Agr., Tech. Bull. 1090, 19 pp (1954).* A long-term study from 1947 to 1951 showed about 40% loss of single DDT applications of 40 and 100 lb/acre after 4 years. Repeated annual increments of 10 and 20 lb/acre had accumulated residues of about 19 and 40 lb/acre, respectively. A repeated annual increment of 20 lb/acre toxaphene had also accumulated a 44 lb/acre residue. A single BHC application of 83.3 lb/acre declined to about

13% whereas a repeated annual application of 16.7 lb/acre produced a residue of 8.7 lb/acre.

85. Boetuis, J. Foul Taste of Fish and Oysters Caused by Chlorophenol. *Medd. Danm. Fisk. Havundersøg, 1, No. 4, 6 pp (1954). WPA, 28, 2347.* The carbolic taste in fish and oysters was traced to chlorophenol in waste waters from a factory manufacturing weed killers.

86. Bollen, W. B., Morrison, H. E., and Crowell, H. H. Effect of Field and Laboratory Treatments with BHC and DDT on Nitrogen Transformations and Soil Respiration. *J. Econ. Entomol., 47:307 (1954).* The different isomers of BHC added to an adobe clay soil at 1,000 ppm in the laboratory produced varying effects on the microbial population, ammonification, and nitrification. In field plots, BHC inhibited nitrogen transformations whereas DDT had no appreciable effect.

87. Bollen, W. B., Morrison, H. E., and Crowell, H. H. Effect of Field Treatments of Insecticides on Numbers of Bacteria, Streptomyces, and Molds. *J. Econ. Entomol., 47:302 (1954).* No immediate, measured, harmful effects resulted from field applications of DDT, BHC, chlordane, aldrin, toxaphene, dieldrin, parathion, and EPN. D-D fumigant decreased numbers of molds and bacteria, but addition of NH_3 with D-D fumigant increased molds.

88. Davis, F. L., and Selman, F. L. Effects of Water Upon the Movement of Dinitro Weed Killers in Soils. *Weeds, 3:11 (1954).* Studies of three oil-soluble and three water-soluble formulations of DNOSBP (2 sec-butyl-4, 6-dinitrophenol) with Norfolk sandy loam, Deer Creek silt loam, and Kaufman silty-clay loam showed that the movement and retention of these dinitro formulations were related to soil texture and the amount of leaching water and the formulation used.

89. Durr, H. J. R. Parathion Spray Residue on Apples and Canned Peaches. *Farming in S. Africa, 29:231 (1954). C. A., 48, 14092g.* The trees were sprayed twice with 15% parathion wettable powder. After 3 weeks, the fruit residue for apples was 0.28 ppm and peaches, 0.29 ppm. After canning, the peaches showed no residue and no taste.

90. Gilpin, G. L., and Redstrom, R. A. Flavor of Peanut Butter as Affected by Aldrin, Chlordan, Dieldrin, Heptachlor, and Toxaphene Used as Insecticides in Growing Peanuts. *J. Agr. Food Chem., 2:778 (1954).* The following application rates, in lb/acre, aldrin, 2-4; toxaphene, 8-25; heptachlor, 4; dieldrin, 2; and chlordane, 10, produced no off-flavor definitely attributable to the insecticide.

91. Ginsburg, J. M., and Reed, J. P. A Survey of DDT Accumulation in Soils in Relation to Different Crops. *J. Econ. Entomol., 47:467 (1954).* Soil type, ranging from loamy sand to clay, did not influence the quantity of residue found in the various crop rotations. Average residues at the time of the study in lb/acre were potatoes, 7; corn, 11; apple orchards under trees, 54, and between trees, 35.

92. Gunthart, E., and Bernet, R. Fate of BHC in the Soil. *Phytiat. - Phytopharm., Spec. Issue, 826 (1954). C. A., 50, 12389f.* Gamma HCH (hexachloro-cyclo-hexane) applied at the rate of 2.500 g/ha (1.7 ppm in the soil) disappears with a half-life of 0.7 years.

93. Hening, J. C., Davis, A. C., and Robinson, W. B. Flavor and Color Evaluation of Canning Crops Grown on Soil Treated with Insecticides. *Food Technol., 8:227 (1954).* Peas, beans, squash, carrots, beets, tomatoes, and spinach were grown on soils treated with aldrin, chlordane, dieldrin, DDT, and heptachlor. No conclusive flavor effects were produced by the insecticides.

94. Hornstein, I., Reynolds, H., and Gilpin, G. L. Benzene Hexachloride Content and Flavor of Peanuts Grown in Rotation with Cotton Dusted with This Insecticide. *J. Agr. Food Chem., 2:776 (1954).* BHC was applied to cotton at 3.5 to 14.0 lb/acre in a 3% dust formulation. There was no off-flavor in peanut butter made from peanuts grown in rotation. No significant residues were detected in the soil or in the peanut butter by use of a method with a sensitivity of 0.1 ppm for soil and 0.2 ppm for peanut butter.

95. Kolbezen, M. J., Metcalf, R. L., and Fukoto, T. R. Insecticidal Activity of Carbamate Cholinesterase Inhibitors. *J. Agr. Food Chem., 2:864 (1954).* Hydrolysis rates are given for 15 carbamate compounds at 37.5°C and pH of 7.3 or 9.5. K hydrolysis rates ranged from 3.4 x 10^{-6} to 4 (min.$^{-1}$).

96. Nex, R. W., and Swezey, A. W. Some Chemical and Physical Properties of Weed Killers. *Weeds, 3:241 (1954).* Properties presented include specific gravity or density, melting point, vapor pressure, pH, and solubility.

97. Ogle, R. E., and Warren, G. F. Fate and Activity of Herbicides in Soils. *Weeds, 3:257 (1954).* This article includes an extensive review of literature, as well as the results of studies on the effect of cation exchange capacity, pH, temperature, soil texture, moisture, and microbial population as major factors contributing to the ultimate fate of herbicides.

98. Orth, H. The Inactivation of Residues of Herbicides Based on Growth - Regulating Substances by Adsorption on Charcoal. *Z. Pflanzenkrankh u. Pflanzenschutz, 61:385 (1954). C. A. 48, 14089d.* One g of carbon inactivated 100 ml of 0.2% emulsion of the esters and salts of 2,4-D and 2,4,5-T. Seeds coated with active carbon were protected from injury by residues.

99. Popp, L., and Bohr, H. Effect of Insecticide Industry Wastes on Trickling Filters and Drainage Organisms. *Gesundh. - Ing., 75:194 (1954). C. A., 48, 11689c.* Hexachlorohexane wastes mixed with city sewage reduced the efficiency of trickling filters by reducing the numbers of organisms such as *Colpidium, Vorticella,* nematodes, *Psychoda* larva, and blue-green algae. Dilution tests showed *Colpidium, Oscillatoria,* and *Daphnia* to be the most sensitive of the organisms tested.

100. Reynolds, H., Gilpin, G. L., and Hornstein, I. Flavor and Benzene Hexachloride Content of Peanuts Grown in Rotation with Cotton Dusted with Insecticides Continaing Benzenehexachloride. *U. S. Dept. Agr., Circ. No. 952, 26 pp (1954).* Numerous peanut and soil samples collected from commercial growers' fields treated with BHC dusts on the cotton crop at 2 to 48 lb/acre of toxicant produced few observations of off-flavor. Chemical determination of BHC in peanut and soil samples were generally too low to be considered significant. The off-flavor of peanuts and the BHC content of peanuts and soil were correlated with the dosage of technical BHC (13% gamma isomer) at rates of 3.8 or 5.1 lb of gamma isomer per acre. No off-flavor in peanuts or significant residue in peanuts or soil was detected from applications of 1.3 to 5.0 lb of gamma isomer per acre with a 36% gamma isomer BHC product.

101. Richardson, L. T. The Persistence of Thiram in Soil and Its Relationship to the Microbial Balance and Damping-Off Control. *Can. J. Botany, 32:335 (1954).* Thiram applied to a sandy soil that was held in a moist condition at room temperature declined from an initial application of 50 ppm to less than 10 ppm in a 9-week storage period.

102. Rogoff, M. H., and Reid, J. J. Biological Decomposition of 2,4-D. *Bacteriol. Proc. (Soc. Am. Bacteriologists), 54:21 (1954). C. A., 51, 15865e.* The conditions under which 2,4-D is decomposed by a *Coxyne* bacterium species are discussed. As much as 1,000 ppm can be decomposed in 3 days in cultures and 80% of 1,000 ppm can be decomposed in 4 hours by resting cells that are suspended in a solution in phosphate buffer at pH 7.1. Chloride ion is formed quantitatively from the compound.

103. Romerio, L., and Aguiar, H. Action of Temperature on Some Insecticides. *Rev. Brasil Malariol. e Doencas Trop., 6:131 (1954). Biol. Abstr., 29, 12480.* Technical grade BHC, lindane, DDT, and dieldrin were deposited on aluminum discs from benzol solutions and loss of weight was determined every 7 days at 3 temperatures, 30°, 35°, and 40°C. After 5 months weight loss was as follows: (1) BHC and lindane were almost completely volatilized. (2) Dieldrin lost 6, 12, and 40% and DDT lost 7, 9, and 12%, respectively, with increasing temperature.

104. Sherburne, H. R., and Freed, V. H. Soil Effects on Herbicides.

Adsorption of 3 (p-Chlorophenyl)-1,1-Dimethylurea as a Function of Soil Constituents. *J. Agr. Food Chem., 2:937 (1954).* Adsorption of 3 (p-chlorophenyl) -1,1-dimethylurea (CMU) by 12 soils with varying composition was highly correlated with organic matter content and significantly correlated with clay content. The inorganic soils adsorbed from 21 to 237 γ/g, while a muck soil, which was 83.3% organic matter, adsorbed 3,453 γ/g. Other organic substances that showed high adsorbtion capacity for CMU are: Norite, 8,200 γ/g; sawdust, 857 γ/g; and straw, 353 γ/g.

105. Spicher, G. The Activity of Flavobacterium Peregrinun as a Destroyer of 2,4-D. *Zentr. Bakteriol. Parasitenk. Abt. II, 108:225 (1954). C. A., 49, 7643e.* This bacterium has an optimum temperature of 25°C and a maximum temperature of 35°C. It is very pH dependent and becomes inactive below pH 5.0.

106. Swanson, C. L. W., Thorp, F. C., and Friend, R. B. Adsorption of Lindane by Soils. *Soil Sci., 78:379 (1954).* Adsorption of lindane by several soils, quartz sand, and other materials was studied by leaching the lindane through columns of the material and determining the lindane retention by weighing. Lindane is retained by adsorption and not by cation exchange. Some relative adsorption values in g of lindane per 100 g of material are quartz sand, 0.00; Penwood loamy sand, 0.014; Berlin silty-clay loam, 0.214; and silica gel, 2.0.

107. Takijima,Y.,and Hayashi,T. The Behavior of 2,4-D in Soils. III. The Mechanism of Adsorption and Fixation of 2,4-D by Soils. *J. Sci. Soil Manure (Japan), 25:49 (1954). C. A., 48, 14,085g.* 2,4-D adsorbed by soils has greater solubility in alkali and salt solutions than in water, particularly Na citrate and NaF. For homionic soils, the relative 2,4-D adsorption was Al soil > H soil > orig. soil > Ca soil. The solubilities of 2,4-D salts in water are Na > Ca > free acid > Al.

108. Wene, G. P., Otey, G. W., and Griffiths, F. P. Effect of Benzene Hexachloride and Lindane on the Flavor of Purple Hull Peas. *Proc. Am. Soc. Hort. Sci., 64:390 (1954).* Dusting peas with 3% BHC caused detectable off-flavor in the processed peas whereas dusting with 1 and 3% lindane did not cause off-flavor.

1955

109. Babers, F. H. The Solubility of DDT in Water Determined Radiometrically. *J. Am. Chem. Soc., 77:4666 (1955).* A suspension of 0.914 mg of radioactive DDT per 100 ml distilled water was equilibrated at a constant temperature for 1 week, centrifuged, and filtered through a fine sintered glass funnel before making determinations on a 0.5 ml aliquot. The solubility values obtained, in ppm, were 0.0059 at 2°C, 0.037 at 25°C, and 0.045 at 37.5°C.

110. Barlow, F., and Hadaway, A. B. Aqueous Suspensions of Insecticides. V. The Sorption of Insecticides by Soil. *Bull. Entomol. Research, 46:547 (1955). C. A., 50, 7381i.* Rapid loss of effectiveness of wettable powders on some soils is attributed to soil adsorption of the insecticide. Quantitative recovery of DDT after 12 months of storage indicates that catalytic decomposition was not associated with the adsorption on Uganda mud.

111. Birk, L. A. Penetration of and Persistence in Soil of the Herbicide 3-(p-Chlorophenyl) 1,1 Dimethylurea (CMU). *Can. J. Agr. Sci., 35:377 (1955).* CMU was applied to a fallow loam at rates of 1.6 to 64 lb/acre. Except in the most heavily treated plots residues were 10 and 4% at the end of 1 and 2 years, respectively. Depth of penetration was positively correlated with application rate.

112. Chisholm, D., MacPhee, A. W., and MacEachern, C. R. Effects of Repeated Applications of Pesticides to Soil. *Can. J. Agr. Sci., 35:433 (1955).* Repeated annual applications of several insecticides for 5 years resulted in accumulation of soil residues. The insecticides tested and the soil accumulation, measured as a percentage of the annual application, are arsenic, 280%; DDT, 260%; parathion, 2.7%; BHC, 83%; and chlordane, 36%. BHC and chlordane were applied for 4 and 3 years, respectively.

113. Fluckiger, E. The Effect of the Application of the Weed-Control Agent Erpan to Pasturage on the Odor and Taste of Milk. *Landw. Jahrb. Schweiz (N. S.), 4:357 (1955). C. A., 49, 15147.* Milk obtained from cows that had grazed on green pasturage treated with Erpan (a commercial 2,4-D product) showed no observable effects. Organolystically, 100 γ Erpan/l milk could be easily detected by both taste and odor.

114. Gar, K. A., and Chernetsova, V. I. Stability of the Toxic Action of Dusts of Gammexane and DDT Under Various Conditions. *Trudy Nauch. Inst. Udobren. i. Insektofungisid. im. Ya. V. Samoilova, No. 156, 55 (1955). C. A., 52, 641i.* Loss of the gamma isomer of gammexane (BHC) increases rapidly with increasing temperature but is not affected greatly by UV light. DDT is strongly affected by UV light whereas increasing temperature does not affect its rate of loss greatly.

115. Ginsburg, J. M. Accumulation of DDT in Soils from Spray Practices. *J. Agr. Food Chem., 3:322 (1955).* Accumulation of DDT under several cropping practices was determined after varying periods of time. Average accumulation in lb/acre were apple orchards with 7 years of treatment, 62.2 under trees and 35.5 between trees; peach orchards with 6 to 7 years of treatment, 19.0 under trees and 9.4

between trees; potatoes with 8 years of treatment, 12.2; 2-year potato rotation with 3 treatments, 3.2; and corn with 3 to 6 years of treatment, 13.7.

116. **Gyrisco, G. G., Evans, W. G., Bunage, R. H., and Briant, A. M.** Further Studies on the Effects of Soil Treatment with Insecticides on Residues and Fruit Quality of Strawberries. *J. Econ. Entomol., 48:700 (1955).* Strawberries grown in soils treated with 1 to 4 lb/acre of aldrin, dieldrin, lindane, or heptachlor contained residues of 0.1 ppm or less. No off-flavor was detected in the fruit.

117. **Hancock, W., and Laws, E. Q.** Determination of Traces of Benzene Hexachloride in Water and Sewage Effluents. *Analyst, 80:665 (1955).* The solubility of the gamma isomer of BHC in water at room temperature was determined as 7 μg/ml. A method is presented for the extraction of BHC from aqueous solutions by means of activated charcoal with subsequent determination of m-dinitrobenzene. The final determination is sensitive to about 5 μg BHC. Identified losses include about 10% in the nitration reaction, 5% from volatilization of m-dinitrobenzene during either removal, and a few percent in carbon extraction.

118. **Hill, G. D., McGahen, J. W., Baker, H. M., Finnerty, D. W., and Bingemen, C. W.** The Fate of Substituted Urea Herbicides in Agricultural Soils. *Agron. J., 47:93 (1955).* Two substituted urea herbicides, 3-(p-chlorophenyl)-1,1-dimethyl urea and 3(3,4-dichlorophenyl)-1,1-dimethylurea, were studied by chemical and bioassay procedures in field and laboratory experiments. Overall dissipation followed a first order rate reaction. It was also demonstrated that soil microorganisms actively degraded 3(p-chlorophenyl)-1,1-dimethyl urea. A sample incubated at 80°F and 60% relative humidity for a period of 22 weeks underwent a 40% loss of the herbicide.

119. **Holluta, J., and Talsky, J.** The Chromatographic Determination of Organic Substances in Natural Waters. *Vom Wasser, 22:212 (1955). W. P. A., 30, 1076.* A paper chromatographic method for identification of taste and odor causing constituents is described and illustrated by examples.

120. **Ivanchenko, A. V.** The Influence of Temperature on the Period of Toxic Activity of Hexachlorane. *Doklady Vsesoyuz. Akad. Sel' skokhoz. Nauk im. V. I. Lenina, 20 (No. 6): 26 (1955). C.A.,50, 7374e.* Loss of hexachlorane is directly proportional to temperature in the range 15° to 55°C. At 55°C the rate is 227 times that at 20°C.

121. **Majewski, F., Steen, J., and Iezzi, T.** Construction and Performance of Trickle Filters at the Rohm and Haas Company. *Proc. 10th Ind. Waste Conf. Purdue Univ. Engng. Extn. Ser. No. 89, 82 (1955).* Heterogeneous organic wastes including those from pesticide

manufacturing are processed through a series of holding basins and trickling filters. The final chlorinated effluent with a BOD and taste concentration threshold of 10 or less is discharged to the Delaware River at a controlled rate.

122. Newhall, A. G. Disinfestation of Soil by Heat, Flooding, and Fumigation. *Botan. Rev., 21:189 (1955).* A comprehensive historical review with several hundred references is presented.

123. Paulini, E., Santos, Lima D. dos, Lenzi, G. de sa, Silva, F. da, and Pedro, J. Chemical Decomposition of BHC. *Rev. Brasil Malariol. e Doencas Trop., 7:81 (1955). Biol. Abstr., 31, 18958.* Gamma BHC in an organic solvent was degraded on contact with Zn or Fe.

124. Pokrovskii, E. A., and Bel'kelvich, V. I. The Losses of Toxicity of Preparations of DDT and Gammexane Under the Action of Temperature and Light. *Trudy Nauch. Inst. Uolobren. i. Insektofungisid. im. Ya. V. Samoilova, No. 156, 214 (1955). C. A., 52, 641g.* The effect of irradiation under daylight or Hg lamp (max $\approx$ 2000 Å) for up to 15 days at temperatures of 25°, 30°, 40°, and 50°C are presented as curves. A constant value of 40 to 60% of the original toxicity is approached.

125. St. John, J. L. Pesticides. *Anal. Chem., 27:654 (1955).* Analytical papers published from 1950 through 1954 are reviewed. 150 references.

126. Sharp, D. H., and Lambden, A. E. Treatment of Effluent from Pesticide Manufacture. *Mfg. Chemist, 26:210 (1955). W. P. A., 28, 2058.* Treatment of wastes from manufacture of dinitro-orthocresol, MCPA, organophosphorus insecticides, fungicides, DDT insecticides, and a number of week killers is discussed. Wastes are passed through charcoal adsorption towers, treated with hydrated lime and settled, neutralized with sulfuric acid, diluted with river water, and mixed with settled sludge or commercial inoculum before biological treatment. Biological treatment includes trickling filters, areation tank, and sedimentation tank. An overall 99% removal of aromatics is accomplished; 90% is removed by the charcoal adsorption and an additional 9% by biological treatment.

127. Van Blaricom, L. O., Foster, H. H., and Evans, C. D. The Effect of Pesticides on the Flavor of Canned Peaches. *Plant Disease Reptr., 39:944 (1955).* Rohm and Haas CR-305 produced marked off-flavor. A sulfur-urea combination caused poor flavor and this was attributed to delay in maturation. Captan caused off-flavor in one season only and this was ascribed to an impurity or the diluent.

128. Zhakov, Y. A., and Taubman, A. N. 14-Ya Itogovaya Sessiya Nauch. Studench. Obshehestva, 24-27 Marta 1953. *1 Moskva Med. Inst. 1953 14-15. Re. Zh., Khim. 1954 No. 20627. C. A., 49, 4210c.*

The odor of hexachloran is perceptible at 0.04 mg/l in cold water and at 0.01 mg/l in 60°C warm water. General sanitary conditions of a reservoir are not affected by up to 2.5 mg/l. Thus the admissible limit is controlled by the odor and should be 0.01 mg/l.

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129. **Banerjee, S. N., and Basu, A.** A Classified Bibliography of Aldrin, Dieldrin, Isodrin, and Endrin Insecticides. *Ann. Zool. (India), 1:179 (1956).* This bibliography includes 533 titles through June 1955.

130. **Bell, G. R.** Photochemical Degradation of 2,4-Dichlorophenoxyacetic Acid and Structurally Related Compounds in the Presence and Absence of Riboflavin. *Botan. Gaz., 118:133 (1956).* UV light degraded 2,4-D and 5 new compounds were revealed by paper chromatography. Photoactivated riboflavin rapidly produced phenols from 2,4-D and related phenoxy compounds with a carboxyl group alpha to the oxygen bridge.

131. **Burchfield, H. P., and Storrs, E. E.** Chemical Structures and Dissociation Constants of Amino Acids, Peptides, and Proteins in Relation to Their Reaction Rates with 2,4-Dichloro-6-(o-Chlorovanilino)-5-Triazine. *Contrib. Boyce Thompson Inst., 18:395 (1956).* The susceptibility of 61 compounds to alkylation by 2,4-dichloro-6-(o-chloroanilino)-5-triazine was investigated.

132. **Casida, J. E.** Metabolism of Organophosphorus Insecticides in Relation to Their Antiesterase Activity, Stability and Residual Properites. *J. Agr. Food Chem., 4:772 (1956).* A review is presented of four basic reactions: (1) metabolic activation of organophosphorous esters, (2) combination of antiesterase with the enzyme, (3) reactivation of phosphoryl esterase enzyme, and (4) fate of acid residue liberated on phosphorylation of esterase. 242 references.

133. **Danielson, L. L.** The Crop Toxicity Period of CMU in a Sandy Clay Loam Soil. *Weeds, 4:255 (1956).* Field experiments were conducted in Virginia to study the relationship between application rate and residual toxicity of CMU [3-(p-chlorophenyl) 1,1-dimethylurea]. Rates up to 5 lb/acre were nontoxic to corn and snap beans after a waiting period of 3 months. Rates of 20 to 50 lb/acre were toxic after a period of 12 months but dissipated to below toxic levels after 24 months. The rates used were far in excess of the normal 1 to 2 lb/acre rates recommended.

134. **Douros, J. D., Jr., and Reid, J. J.** Decomposition of Certain Herbicides by Soil Microflora. *Bacteriol. Proc. (Soc. Am. Bacteriologists), 56:23 (1956). C. A., 52, 15796a.* Species which decomposed 2,4-dinitro-

o-sec butyl-phenol (I) and 3 (p-chlorophenyl) 1,1-dimethylurea (II) were isolated from soil. Up to 100% of (II) was decomposed within 20 days.

135. **Foster, A. C., Boswell, V. R., Carter, R. H., Gilpin, G. L., Pepper, B. B., Anderson, W. S., and Gieger, M.** Some Effects of Insecticide Spray Accumulations in Soil on Crop Plants. *U. S. Dept. Agr., Tech. Bull. No. 1149 (1956).* Cooperative studies at State College, Miss., New Brunswick, N. J., and Beltsville, Md., show that residue accumulation was least at State College, Miss. Accumulation data for 10 to 12 commonly used insecticides are presented for each experimental location.

136. **Gundersen, K., and Jensen, H. L.** A Soil Bacterium Decomposing Organic Nitro Compounds. *Acta Agr. Scand., 6:100 (1956). C. A.,50, 10958b.* An atypical strain of *Corynebacterium simplex*, isolated from soil, will decompose dinitro-o-cresol, p-nitrophenol, 2,4-dinitrophenol, and 2,4,6-trinitrophenol, but has little effect on other nitrophenols. Nitrites are produced by the decomposition. Optimum activity of the organism is at pH 7.8 to 8.0 and 25°C. Decomposition starts within 24 hours.

137. **Hinreiner, E., and Simone, M.** Effect of Soil Insecticides on Flavor of Vegetable Crops. *Hilgardia, 26:76 (1956).* BHC at 1/2 lb/acre caused severe off-flavor in canned carrots and sweet potatoes. Off-flavor in fresh vegetables was less but still noticeable. Lindane at 1 lb/acre caused off-flavor in fresh white potatoes but not in fresh sweet potatoes and carrots. Other insecticides caused no off-flavor when applied as follows: aldrin, 10 lb/acre; dieldrin, 3 lb/acre; endrin, 5 lb/acre; chlordane, 20 lb/acre; heptachlor, 10 lb/acre; DDT, 10 lb/acre; and parathion, 5 lb/acre.

138. **Holstun, J. T., and Loomis, W. E.** Leaching and Decomposition of 2,4-Dichloropropionic Acid in Several Iowa Soils. *Weeds, 4:205 (1956).* Bioassay procedures were employed to follow the toxicity of dalapon (2,2-dichloropropionic acid) residues in several Iowa soils. Leaching studies showed that dalapon is readily leached with water and that soil type, among the soils used, had little effect on leaching. Decomposition in the soil is hastened by factors that favor high microbial activity.

139. **Ivanov, K. A.** Solubility of Benzene Hexachloride in Water. *Gigiena i Sanit., 21 (No. 9): 82 (1956).* The solubility of a technical BHC in water was determined to be 8 to 8.5 mg/l. Solubility increased with contact time up to 24 hours and with increasing initial suspension concentration up to 20 mg/l.

140. **Jones, L. W.** Effects of Some Pesticides on Microbial Activities of the Soil. *Utah State Agr. Coll., Agr. Expt. Sta. Bull. No. 390,*

17 pp (1956). Incubation for a 3-year period showed DDT and BHC (10% gamma) to be very stable in soil whereas chlordane was much less stable. Higher organic matter content in the soil increased the loss of insecticide whereas increasing the applied concentration reduced the percentage loss. Average percent remaining after 3 years were DDT, 60%; BHC, 58%; and chlordane, 6%.

141. **Keilling, J.** The Contamination of Soil and Water by Products Utilized in Agriculture. *Eau, 43:277 (1956). W. P. A., 31, 2444.* The author discussed pollution of soil and water by-products used in agriculture. The nitrogen cycle is discussed and it follows that enrichment of the concentration of nitrogen in the soil by use of fertilizers will give a corresponding increase in nitrogen in the drainage water. Harmful effects of the presence of free sulphides, copper, arsenic, and organic products in drainage water are discussed.

142. **Kramer, A., and Ditman, L. P.** Detecting Flavor Changes in Vegetables Treated with Pesticides. *Food Technol., 10:155 (1956).* Data are presented to show that a simplified variables taste panel method is superior to an attributes method (Triangular taste test).

143. **Leopold, A. C.** The Fate of 2,4-D in Plants and Soils. *Proc. N. Central Weed Control Conf., 13:4 (1956).* The order of adsorption on charcoal and steam-killed plant leaves was 2,4,5-T>2,4-D > 4 chlorophenoxyacetic acid. TBA was adsorbed 1/2 as strongly as 2,4-D.

144. **Malina, M. A., Goldman, A., Trademan, L., and Polen, P. B.** Deactivation of Mineral Carriers for Stable Heptachlor Dust Formulations. *J. Agr. Food Chem., 4:1038 (1956).* Carriers with high surface acidity such as Attaclay and Barden Clay cause relatively rapid degradation of heptachlor even at room temperature. Rate of degradation increases rapidly with temperature. Oxygen-containing additives such as diethylene glycol are effective in stabilizing formulations.

145. **Sazonov, P.V., Bogdarina, A. A., and Gudkova, A. S.** Biological Activity of Aqueous Solutions of DDT and HCH. *Trudy Vsesoyuz Inst. Zashchity Rastenu, No. 7, 128 (1956).* The solubility of DDT in water was determined to be less than 1 ppm. The solubility of hexachlorocyclohexane increased from 2.8 ppm after 2 hours of stirring to 31.8 ppm after 36 hours of stirring.

146. **Sherburne, H. R., Freed, V. H., and Fang, S. C.** The Use of C^{14} Carbonyl Labeled 3 (p-Chlorophenyl)-1, 1-Dimethyl-Urea in a Leaching Study. *Weeds, 4:50 (1956).* Laboratory studies with sandy-loam and clay-loam soil columns in 9-inch by 10-mm soft glass tubes showed that leaching of CMU increased by increasing water of percolation from 1 inch to 9 inches of water and that leaching was greater in sandy loam than in clay loam.

147. **Steenson, T. I., and Walker, N.** Observations of the Bacterial Oxidation of Chlorophenoxyacetic Acids. *Plant and Soil, 8:17 (1956).* Three bacterial strains, isolated from soil, could decompose 2,4-D, MCPA, or p-chlorophenoxyacetic acid. Aerobic conditions are essential to the bacterial decomposition of 2,4-D. Pretreatment of the soil with one of the chlorophenoxyacetic acids accelerated the breakdown rate of either of the other two. The bacterial decomposition of these herbicides was attributed to adaptive enzyme formation.

148. **Stier, E. F., and Maclinn, W. A.** The Effect of Herbicide Karmex-W on Flavor of Canned and Frozen Asparagus. *Food Technol., 10:26 (1956).* Flavor differences were detected in only two of eight harvest dates for frozen samples and in none of six harvest dates for canned samples from experimental asparagus plots. In commercially canned samples, no off-flavor was detected in three of nine harvest dates after 9 months of storage.

149. **Sund, K. A.** Residual Activity of 3-Amino-1,2,4-Triazole in Soils. *J. Agr. Food Chem., 4:57 (1956).* A colorimetric method is presented for the determination of 3-amino-1,2,4-triazole, which is proportionately correlated with its phytotoxicity to tomato plants. Soil studies indicated that the compound becomes tightly adsorbed and that it has a tendency to complex metals.

150. **Thomas, F. J. D.** Residual Effects of Crop-Protection Chemicals in the Soil. *Plant Protect. Conf. 1956, 2nd Proc. Intern. Conf. Fenhurst Research Sta., England. p. 215.* A review of persistence of soil residues from crop-protecting chemicals and the effect of the chemicals on microorganisms is given. 43 references.

151. **Turich, M. L.** The Effect of Ultraviolet Irradiation on DDT. *Med. Parazitol. i. Parazitarnya Bolezni (Moscow) 25:69 (1956). Ref. Zh. Biol., 1957, No. 23181 (Translated by U. S. Joint Pub. Res. Serv.) Biol. Abstr., 33, 27714.* Under influence of UV irradiation, crystalline DDT changes in physical, chemical, and insecticidal activity. DDT preparations that do not crystallize degrade with greater intensity.

152. **Walker, R. L., and Newman, A. S.** Microbial Decomposition of 2,4-Dichlorophenoxyacetic Acid. *Appl. Microbiol., 4:201 (1956). C.A., 50, 14872.* A culture tentatively classified as *Mycoplana*, which rapidly decomposed 2,4-D in solid and liquid synthetic media, was isolated from Duffeld silt loam that had been supplemented with the plant hormone.

153. **Wylie, W. D.** Determination of Insecticide Residues in Soil by Using Drosophila. *J. Econ. Entomol., 49:638 (1956).* Considerable amounts of insecticide residues remained in soils taken from two peach-growing areas in Arkansas 4-1/2 years after application. The

insecticides in descending order of residue on a percentage basis were BHC, dieldrin, DDT, chlordane, and parathion. Residues ranged from 0.16 to 10.2 ppm in soil.

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154. **Bell, G. R.** Some Morphological and Biochemical Characteristics of a Soil Bacterium Which Decomposes 2,4-Dichlorophenoxyacetic Acid. *Can. J. Microbiol., 3:821 (1957).* An *Achromobacter* species, isolated from soil, could oxidize 2,4-D, 2-methyl-4-chlorophenoxyacetic acid, 2,4,5-T, and 2,4-dichlorophenol. Approximately 94% of the chlorine from 2,4-D was released as chloride.

155. **Birdsall, J. J., Weckel, K. C., and Chapman, R. K.** Effects of Chlorinated Hydrocarbon Insecticides on Flavors of Vegetables. *J. Agr. Food Chem., 5:523 (1957).* Triangular taste tests of the effect of 7 insecticides on 12 vegetable crops showed that changes in flavor were more pronounced in canned samples than in raw or cooked samples. Of the 7 insecticides tested, aldrin, dieldrin, endrin, chlordane, heptachlor, lindane, and toxaphene, only lindane had a consistently undesirable effect on flavor.

156. **Burchfield, H. P., and Storrs, E. E.** Relative Reactivities of 1-Fluoro-2,4-Dinitrobenzene and 2,4-Dichloro-6-(o-Chloroanilino) s-Triazine with Metabolites Containing Various Functional Groups. *Contrib. Boyce Thompson Inst., 19:169 (1957).* The second-order reaction rate constants at 29°C and pH 7.0 or 8.0 were dependent on hydrogen ion activity except for compounds with pK' values considerably lower than the pH values of the media. Very large differences in relative reactivity were observed among compounds with different functional groups.

157. **Byrde, R. J. W., and Woodcock, D.** Effect of the Interaction Between Chelating Agents on Their Fungitoxicity. *Nature, 179:539 (1957).* The role of copper chelates in the fungitoxicity of 8-hydroxyquinolines is demonstrated for three compounds.

158. **Call, F.** Determination of the Vapor Pressure of Ethylene Dibromide. *J. Sci. Food Agr., 8:81 (1957).* The vapor pressure of ethylene dibromide at 20°C was 7.69 or 8.09 mm Hg as determined by static or dynamic methods, respectively.

159. **Cook, J. W., and Pugh, N. D.** A Quantitative Study of Cholinesterase-Inhibiting Decomposition Products of Parathion Formed by Ultraviolet Light. *J. Assoc. Offic. Agr. Chemists, 40:277 (1957).* Degradation of a 2-μg quantity of parathion by strong ultraviolet light was 0.5, 0.76, 6.0, and 6.0%, respectively, after exposure times of 15, 30, 60, and 90 minutes. The degradation was determined by paper chromatography.

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160. **Frederick, L. R., Starkey, R. L., and Segal, W.** Decomposability of Some Organic Sulfur Compounds in Soil. *Soil Sci. Soc. Amer. Proc., 21:287 (1957).* Among other results there was no evidence of decomposition of Na diethyldithiocarbamate to sulfate in soil. Decomposition of a number of organic sulfur compounds as determined by sulfate production was not related to type of S-linkage.

161. **Freed, V. H., and Burschel, P.** Relation of Water Solubility to Dosage of Herbicides. *Z. Pflanzenkrankh. u. Pflanzenschutz, 64:477 (1957). C. A., 53, 20669c.* A plot of dosage required to produce phytotoxicity versus water solubility gave a regression coefficient of 0.605, significant at 0.05 level.

162. **Gilpin, G. L., Parks, A. B., and Reynolds, H.** Flavor of Selected Vegetables Grown in Pesticide-Contaminated Soils. *J. Agr. Food Chem., 5:44 (1957).* Relatively large soil residues of aldrin, dieldrin, heptachlor, dilan, toxaphene, chlordane, endrin, isodrin, DDT, TDE, and methoxychlor did not cause significant flavor changes in carrots, turnips, and green beans. Relatively large soil residues of BHC and lindane caused off-flavor in carrots, turnips, and green beans. In a separate study, alpha, beta, and delta isomers of BHC caused off-flavor in carrots.

163. **Goring, C. A. I., and Youngson, C. R.** Factors Influencing Nematode Control by Ethylene Dibromide in Soil. *Soil Sci., 83:377 (1957).* Diffusion of ethylene dibromide was decreased by decreasing soil pore space. Additions of organic matter decreased the effectiveness of ethylene dibromide for nematode control. Diffusion from the point of injection was uniform in all directions.

164. **Jensen, H. L.** Decomposition of Chloro-Substituted Aliphatic Acids by Soil Bacteria. *Can. J. Microbiol. 3:151 (1957).* Three groups of bacteria, a *Pseudomonas*-like group, an unidentified nonspore-forming group, and an *Agrobacterium*-like group, capable of decomposing chloro-substituted aliphatic acids were isolated from soil. Each group exhibited varying ability to attack several halogenated acetic and propionic acids. Trichloroacetic acid, a common herbicide, was actively degraded by the nonspore-forming group in media containing soil extract or Vitamin B_{12}.

165. **Jettmar, H. M.** Pollution of Ground Water by Substances Difficult to Decompose. *Ost. Wasserw., 9:56 (1957).* BHC applied to surface soil contaminated the shallow-well (33 ft) water supply of Basel, Switzerland, and produced a disagreeable taste. Also cited are two cases of ground-water pollution by trichloroethylene. In one case contamination of a well by seepage from a waste pit at a distance of 150 meters persisted for at least 4 years.

166. Jurinak, J. J. Adsorption of 1,2-Dibromo-3-Chloropropane by Soils. *J. Agr. Food Chem., 5:598 (1957).* Adsorption of 1,2-dibromo-3-chloropropane by seven California soils, ranging from sandy loam to clay in texture and including a muck, obeyed the BET adsorption equation. Adsorption appears to be a function of external surface area and clay mineral type. On a unit-weight basis, adsorption by the muck was low in comparison with that by mineral soils. On a unit-surface basis, adsorption on muck was similar to that on illitic and kaolinitic mineral soils.

167. Jurinak, J. J. The Effect of Clay Minerals and Exchangeable Cations on the Adsorption of Ethylene Dibromide Vapor. *Soil Sci. Soc. Amer. Proc., 21:599 (1957).* The BET equation was used to investigate adsorption of EDB by clays. The effect of the cations Mg, Ca, and Na was attributed to the effect of water of hydration on the adsorbing surface. Adsorption on Ca montmorillonite is more restricted than on Ca illite or Ca kaolinite.

168. Jurinak, J. J., and Volman, D. H. Application of the Brunauer, Emmett, and Teller Equation to Ethylene Dibromide Adsorption by Soils. *Soil Sci., 83:487 (1957).* Adsorption of EDB by seven soils at 24.6°C and zero relative humidity could be explained by the BET equation at 0.6 or 0.7 relative pressure. It appears that adsorption is restricted to external surfaces. The heat of adsorption on montmorillonitic soils was approximately 700 to 1,100 calories per mole greater than on kaolinitic or illitic soils.

169. Lembeck, W. J., and Colmer, A. R. Aspects of the Decomposition and Utilization of Maleic Hydrazide by Bacteria. *Weeds, 5:34 (1957).* Two organisms identified as *Alcaligenes faecalis* and *Flavobacterium diffusum* were among bacteria isolated from a sugar cane soil that could utilize the diethanolamine salt of maleic hydrazide. *Alcaligenes faecalis* formed a gum when grown in a liquid medium containing maleic hydrazide and 2,500 ppm glucose. The optimum concentration of maleic hydrazide for gum formation was about 5,000 ppm.

170. Lichtenstein, E. P. DDT Accumulation in Midwestern Orchard and Crop Soils Treated Since 1945. *J. Econ. Entomol., 50:545 (1957).* Apple and peach orchards treated with DDT for 3 to 11 years had residues of 3 to 197 lb/acre in the top 6 inches of soil. These residues represent as much as 8 times the average annual application. Residues in the top 6 inches of annual crop soils ranged from 0.0 to 7.75 lb/acre.

171. Linden, G., and Schicke, P. The Fungicidal and Herbicidal Effect of Vapam in the Soil with Regard to Depth of Penetration, Adsorption, and Waiting Period After Treatment. *Mededel. Landbouwhogeschool en Opzoekingsstas. Staat Gent, 22:399 (1957). C. A., 53, 6507b.* Vapam is adsorbed by soil and penetrates deeper than the wetting front. The penetration below the wetting front is a function of concentration and vapor pressure.

172. Matell, M., and Linddenfors, S. Thermodynamic Dissociation Constants of 2,4-Dichlorophenoxyacetic Acid (2,4-D) and Some Related Plant-Growth Regulators. *Acta Chem. Scand., 11:324 (1957). C. A., 52, 11534f.*

Compound	Equivalent conductance, ∝ dil	Thermodynamic dissociation, K
2,4-D	361.1	$12.7 \pm 0.1 \times 10^{-4}$
2 Methyl, 4 chlorophenoxyacetic acid	374.0	$7.8 \pm 0.03 \times 10^{-4}$
4 Chlorophenoxyacetic acid	370.8	$9.79 \pm 0.04 \times 10^{-4}$
2,4,5-T	362.7	$14.7 \pm 0.1 \times 10^{-4}$
2-Chlorobenzoic acid	373.4	$12.6 \pm 0.1 \times 10^{-4}$

173. Mills, R. E. Progress Report on the Bio-Oxidation of Phenolic and 2,4-D Waste Waters. *Fourth Ontario Industrial Waste Conference, June 1957. Ontario Water Resources Commission, Water and Pollution Advisory Committee Rept., 160pp. W. P. A. , 32, 2281.* In a pilot plant operation, the waste water is neutralized with ammonia, filtered through Dowpac HCS, and digested in an activated-sludge tank. Sludge tank effluent is recirculated to the filters, and the sludge is passed to a sedimentation tank before being returned to the system. Phenolic waste removal was adequate (99 to 100%). The 2,4-D waste (mostly dichlorophenol) is more difficult to treat and further study is needed.

174. Muhlmann, R., and Schrader, G. Hydrolysis of the Phosphoric Acid Ester Insecticides. *Z. Naturforsch., 12b:196 (1957).* P^{32} labeling was used to study the effect of varying temperatures from 20° to 70°C and pH from 1 to 9 on the hydrolysis rate constants of 21 compounds.

175. Sheets, T. J., and Crafts, A. S. The Phytotoxicity of Four Phenylurea Herbicides in Soil. *Weeds, 5:93 (1957).* Four compounds, monuron, diuron, fenuron, and DMU, were detoxified more rapidly in soil with active microbial populations. Fenuron was the first to be detoxified in soil. The initial toxicity of diuron and DMU was greater in nutrient solution, but less in soil, indicating a selective, rapid inactivation of these two compounds in soil.

176. Smith, A. E., Feldman, A. W., and Stone, G. M. Mobility of N-1-Naphthylphthalamic Acid (Alanap-1) in Soil. *J. Agr. Food Chem., 5:745 (1957).* The moderate mobility of alanap-1 in soil can be decreased by mixing with a carrier rich in cations or by mixing with a water-insoluble organic acid.

177. Subba-Rao, N., and Pollard, A. Stability of Rotenone. *J. Sci. Food Agr., 2:462 (1957).* Rotenone loses all toxicity in the soil after 5 to 6 days in the spring and 2 to 3 days in the summer.

178. Sumiki, Y., and Matsuyama, A. Infrared Spectrophotometric Determination of Traces of Pollution in Water. *Bull. Agr. Chem. Soc. Japan, 21:329 (1957).* A spectrophotometric procedure for detection of parathion in water is described. The procedure, giving 94% recovery, includes liquid-liquid extraction followed by chromatographic cleanup prior to identification in the infrared region.

179. Tarzwell, C. M., and Henderson, C. Toxicity of Dieldrin to Fish. *Trans. Am. Fisheries Soc., 86:245 (1957).* Bioassay was used to determine dieldrin in the runoff from an area treated at the rate of 4.66 lb/acre. Dieldrin was detected throughout the first and at the beginning of the second runoff-producing rain. The total dieldrin detected in the runoff was only a small fraction of that applied.

180. Troyansv, I. A., Bekher, R. M., Krayukhina, N. N., Shein, S. M., Myshkins, N. P., Koganovskii, A. M., and Taran, P. N. Purification of Industrial Waste Waters from Organic Substances by Sorption. *Khim. Nauk. Prom., 2:672 (1957). W. P. A., 31, 1453.* Organic compounds can be removed by activated carbon columns. Columns are regenerated by treatment with superheated steam to remove volatiles and with sodium hydroxide to saponify other substances for elution by water. Carbon is activated with HCl.

181. Upchurch, R. P., and Pierce, W. C. The Leaching of Monuron From Lakeland Sand Soil. I. The Effect of Amount, Intensity, and Frequency of Simulated Rainfall. *Weeds, 5:321 (1957).* Monuron was readily leached from 3-inch by 36-inch, reconstituted, Lakeland-sand soil columns. Twelve inches of water applied as eight increments at 1/2-hour intervals leached 89% of a 40-lb/acre surface application below 8 inches and 51% below 24 inches in the column. Water applied at intervals of 24 hours or greater caused much less leaching of the monuron.

182. Webley, D. M., Duff, R. B., and Farmer, V. C. Formation of a β-Hydroxy-Acid as an Intermediate in the Microbiological Conversion of Monochlorophenoxybutyric Acids to the Corresponding Substituted Acetic Acids. *Nature, 179:1130 (1957).* The β oxidation mechanism is affected by the placement of chlorine substituents on the phenoxy ring.

183. Weidhaas, D. E. Adsorption of DDT, Methoxychlor, and Some Related Compounds on Insecticide Dust Diluents and Carriers. *J. Econ. Entomol., 50:429 (1957).* The diluents used were Panther Creek Bentonite, Diluex A, Barden Clay, Celite 209, and Pyrax ABB. Adsorption is dependent on the properties of both the carrier and the chemical. Methoxychlor and methoxy DDE were observed to react with Panther Creek Bentonite, Diluex A, and Barden Clay.

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184. **Ahmed, M. K., and Casida, J. E.** Metabolism of Some Organophosphorous Insecticides by Microorganisms. *J. Econ. Entomol., 51:59 (1958).* Organophosphates studied included thimet, American, Cyanamid 12008, parathion, Dow ET-57, dimefox, and schradan. Organisms used were the yeast, *Torulopsis utilis*; the bacteria, *Pseudomonas fluorescens* and *Thiobacillus thiooxidans*; and the green algae, *Chlorella pyrenoidosa.* Behavior of the organisms varied from chemical to chemical.

185. **Tweed River Purification Board.** Fourth Annual Report for the Year to May 15, 1958. *26 pp, 1 fold map. W. P. A., 33, 178 (1960).* Fish kills caused by DDT and gammexane (BHC) are reported and insecticide discharge to sewers is given as the cause of biological treatment difficulties at a sewage works.

186. **Bollen, W. B., Roberts, J. E., and Morrison, H. E.** Soil Properties and Factors Influencing Aldrin-Dieldrin Recovery and Transformation. *J. Econ. Entomol., 51:214 (1958).* Recoveries of insecticide 21 months after a 5 ppm application to a Chehalis silt loam were 23% for aldrin and 27% for dieldrin when aldrin was added, and 7% for aldrin and 60% dieldrin when dieldrin was added. The aldrin-dieldrin transformation or percent recovery were not correlated with microbial activity or soil properties.

187. **Bowman, J. S., and Casida, J. E.** Further Studies on the Metabolism of Thimet by Plants, Insects, and Mammals. *J. Econ. Entomol., 51:838 (1958).* Data on the alkali hydrolysis of thimet and its oxidation products are included. The rate constant for thimet in 0.1 M Na_2CO_3 is 0.00011 (min.$^{-1}$).

188. **Brown, A. L., Jurinak, J. J., and Martin, P. E.** Relation of Soil Properties to Br Uptake by Plants Following Soil Fumigation with Ethylene Dibromide. *Soil Sci., 86:136 (1958).* Increase in water-soluble inorganic Br in EDB-treated soils was correlated with the increasing clay content of the soil.

189. **Dewey, J. E.** Utility of Bioassay in the Determination of Pesticide Residues. *J. Agr. Food Chem., 6:274 (1958).* A review of bioassay techniques for the quantitative determination of pesticide residues is presented. 117 references.

190. **Dowler, C., Baughman, N. M., and Veatch, C.** The Effect of Soil Type, Soil pH, and Simulated Rainfall on the Distribution of DNBP in the Soil. *Weeds, 6:281 (1958).* Bioassay with corn and soybeans showed that residual phytotoxicity of DNBP is influenced by rainfall, organic matter content, pH, and composition of the soil. Higher pH

and soil organic matter content decreased residual phytotoxicity. Increased rainfall and soil composition greatly affected translocation of DNBP in the soil.

191. Eno, C. F. What Pesticides Do To Soils: 2. Insecticides and the Soil. *J. Agr. Food Chem., 6:348 (1958).* In general, insecticides, at normal use rates, do not affect microorganisms in soil adversely. BHC has, however, been reported to have adverse effects at normal use rates in some instances.

192. Ettinger, M. B., and Rosen, A. A. Tastes and Odors in Water. *Ind. Wastes, 3:85 (1958).* Taste and odor of phenolic compounds are greatly increased by ordinary chlorination whereas free residual chlorination destroys the odor.

193. Frawley, J. P., Cook, J. W., Blake, J. R., and Fitzhugh, O. G. Effect of Light on Chemical and Biological Properties of Parathion. *J. Agr. Food Chem., 6:28 (1958).* UV irradiation of parathion produces a mixture of compounds with increased *in vitro* anticholinesterase activity. This mixture is less toxic to flies, has less *in vivo* anticholinesterase activity in rats, and less reactability to the Averell-Norris chemical analysis method.

194. Gannon, N., and Bigger, J. H. The Conversion of Aldrin and Heptachlor to Their Epoxides in Soil. *J. Econ. Entomol., 51:1 (1958).* Aldrin and heptachlor are partially converted to dieldrin and heptachlor epoxide, respectively, in soil. The products, dieldrin and heptachlor epoxide, are also highly toxic and are very persistent in soils.

195. Glasser, R. F., Blenk, R. G., Dewey, J. E., Hilton, B. D., and Weiden, M. H. J. Occurrence of a Toxic Non-Aldrin Residue in Carrots Grown on Aldrin-Treated Soil. *J. Econ. Entomol., 51:337 (1958). Biol. Abstr.,* 32, *42,177.* A toxic compound absorbed from aldrin-treated soils by carrots was identified as dieldrin.

196. Herne, D. C., and Chisholm, D. Accumulation of DDT in the Soil of an Ontario Peach Orchard. *Can. J. Soil Sci., 38:23 (1958).* Two sites were studied. One had received 4 years of DDT treatment from 1946 to 1949 averaging 5.5 ppm/year and had an average residue of 3.6 ppm when sampled in 1954. The other had received 9 years of DDT treatment averaging 3.9 ppm/year and had an average residue of 4.3 ppm when sampled in 1954. Residues were greater near tree trunks and 95% of the residue was in the cultivated zone.

197. Hollis, J. P. Specifications for Ideal Nematocides. *Plant Disease Reptr., 42:291 (1958).* The water solubility and vapor pressure of some common nematocides are listed.

Compound	Water solubility, % at room temp	Vapor pressure, mm Hg
Dowfume MC-2	0.09	1,824 at 30°C
DD	0.28	29 at 21.1°C
Dowfume W-85	0.41	11.7 at 25°C
Nemagon	0.10	0.8 at 21.1°C

198. Hurtt, W., Meade, J. A., and Santelmann, P. W. Effect of Various Factors on the Movement of CIPC in Certain Soils. *Weeds, 6:425 (1958). C. A., 53, 10640c.* CIPC pentetrated to a greater depth in dry sandy loam than in moist sandy loam. In clay soil the reverse was found. After 8 days CIPC penetrated deeper in moist clay than in a sandy-loam soil, whereas the penetration was the same in dry soils. The herbicide moved deeper in a clay soil of pH 4.2 than in a soil of pH 7.1. In a Beltsville series soil, an increase in organic matter reduced downward movement.

199. Kiigemagi, U., Morrison, H. E., Roberts, J. E., and Bollen, W. B. Biological and Chemical Studies on the Decline of Soil Insecticides. *J. Econ. Entomol., 51:198 (1958).* The agreement among the specific phenylazide method, the nonspecific total chloride method and bioassay was very poor for aldrin and dieldrin when they were used to follow the decline of these compounds with time. The decline of these insecticides in soil was not correlated with microbial activity or several soil properties.

200. Lichtenstein, E. P. Movement of Insecticides in Soils Under Leaching and Non-Leaching Conditions. *J. Econ. Entomol., 51:380 (1958).* Field studies with aldrin, lindane, and DDT were made on a silt loam and a muck soil at Madison, Wisconsin. After 17 months 60 to 95% of the insecticide recovered was in the 0- to 3-inch layer where it had been incorporated initially. At the end of 3 years lindane and aldrin had shown a marked downslope movement on the Miami silt loam. In laboratory experiments lindane was leached downward very slowly and P^{32} parathion moved in a pattern that would be expected if movement were by diffusion.

201. Ludwig, R. A., and Thorn, G. D. The Interaction Between Disodium Ethylenebisdithiocarbamate (Nabam) and Manganese. *Can. J. Botany, 36:473 (1958).* Trace amounts of manganese catalyze the oxidation of nabam. The conversion to ethylene thiuram monosulphide was found to be pH dependent.

202. Malov, G. A. Sewage Water from the Manufacture of Parathion. *Vodosnabzhenie i Sanit. Tekh, 5:31 (1957). C. A., 52, 7582 (1958).* Detectable concentrations of parathion (mg/l) are taste, 0.08; color, 0.10; odor, 0.003; irritating action, 0.006.

203. March, R. B. The Chemistry and Action of Acaricides. *Ann. Rev. Entomol., 3:355 (1958).* An extensive review on the biological activity of acaracides is made. The chemistry section includes water solubility, vapor pressure, and chemical stability data for many compounds. 151 references.

204. Martin, J. P., and Pratt, P. F. What Pesticides Do to the Soil: 1. Fumigants, Fungicides, and the Soil. *J. Agr. Food Chem., 6:345 (1958).* These pesticides have a marked effect on soil microorganisms. Generally a sharp reduction in numbers is followed by an increase due to bacteria and actinomycetes that are different in species composition. Nitrifiers are relatively sensitive and the nitrification process is inhibited frequently.

205. Munnecke, D. E. The Persistence of Nonvolatile Diffusible Fungicides in Soil. *Phytopathology, 48:581 (1958).* The persistence of four nonvolatile soil fungicides was studied in an artificial California soil mix composed of 50% fine sand and 50% German peat moss. In a 2-month experiment captan was stable, semesan was rapidly deactivated biologically, and nabam and ferbam were inactivated nonbiologically.

206. Nazarov, G. W. Comparative Volatilities of Chloretone, Camphor, Naphthalene, Chloral Hydrate, Hexachloran, and DDT. *Trudy Saratov. Zoovet. Inst., 7:319 (1958). C. A., 54, 16,968d.* With a temperature range of 27° to 34°C and a relative humidity range of 22 to 60%, hexachloran (10%) volatilized completely in 14 days. DDT loss was 1, 25, and 33%, respectively, after 6 months, 1 year, and 2 years.

207. Newell, J. E., Mazaika, R. J., and Cook, W. J. The Microdetermination of 2,3-Dichloro-1,4-Naphthoquinone (Phygon) in Water. *J. Agr. Food Chem., 6:669 (1958).* A spectrophotometric method for the determination of micro amounts of Phygon in water is described. Insoluble matter in water is removed by filtration. The filtrate is acidified with phosphoric acid, and Phygon is distilled from the filtrate. Phygon is extracted by chloroform from the filtrate and then determined by its ultraviolet absorption spectrum. The method is applicable in the range of 8 to 250 ppb with an average recovery of 86%.

208. Newman, A. S., and Downing, C. R. Herbicides and the Soil. *J. Agr. Food Chem., 6:352 (1958).* This is a brief review article on the effect of commonly used herbicides on soil microorganisms. There is no indication that normal applications of presently used herbicides seriously injure microorganisms or inhibit microbial processes.

209. Rahn, E. M., and Baynard, R. E., Jr. Persistence and Penetration of Monuron in Asparagus Soils. *Weeds, 6:432 (1958).* Monuron applied at the rates of 0.8 lb/acre and 1.6 lb/acre twice annually for

4 years did not produce a phytotoxic residue at the end of the fourth year. A smilar experiment with a rate of 3.2 lb/acre produced a residue of 0.4 lb/acre in the 0- to 8-inch soil layer after 5 years.

210. **Sandi, E.** Reduction of Parathion Induced by Light. *Nature, 181:499 (1958).* Cu^{++} catalyzes the hydrolysis of parathion to p-nitrophenol. The reaction is suppressed by agents that chelate copper. Direct sunlight or irradiation with a mercury discharge lamp causes reduction of parathion in barbituate buffer at pH 8.0.

211. **Sheets, T. J.** The Comparative Toxicities of Four Phenylurea Herbicides in Several Soil Types. *Weeds, 6:413 (1958).* The phytotoxic concentration of DMU, diuron, fenuron, and monuron was positively correlated to percent organic matter, cation exchange capacity, and percent clay. The average relative rate of detoxification for 17 soils was fenuron > monuron = DMU > diuron. Although monuron and diuron moved relatively slowly in a leaching study, monuron moved about twice as fast as diuron.

212. **Steenson, T. I., and Walker, N.** Adaptive Patterns in the Bacterial Oxidation of 2,4-Dichloro and 4-Chloro,2-Methyl-Phenoxyacetic Acid. *J. Gen. Microbiol., 18:692 (1958).* A strain of *Flavobacterium peregrinum* and a strain of *Achromobacter* capable of decomposing 2,4-D and MCPA, respectively, were obtained from peptone agar plate cultures enriched with the herbicide. The 2,4-dichlorophenol or 5-chloro-2-cresol could be used to induce the *Achromobacter* strain to oxidize 2,4-D and MCPA.

213. **Sweet, R. D., Feddema, L., Crabtree, G., and Bakes, D.** Longevity of Several Herbicides in Soils. *Proc. Northeast Weed Control Conf., 12:17 (1958).* The phytotoxicity of simazine persisted for two growing seasons. Trichlorobenzoic acid, high in 2,3,6-isomer, persisted 1 year. Amino triazole, CDAA, dalapon, TCA, and 2,4-D were nonphytotoxic after 5 weeks.

214. **Upchurch, R. P.** The Influence of Soil Factors on the Phytotoxicity and Plant Selectivity of Diuron. *Weeds, 6:161 (1958).* There was a tenfold difference in the application rate required to produce equivalent initial toxicity in 12 soils. Of 11 soil properties measured only organic matter content and cation exchange capacity were correlated with the difference in application rate required to produce equivalent phytotoxicity.

215. **Upchurch, R. P., and Pierce, W. C.** The Leaching of Monuron from Lakeland Sand Soil, Part II. The Effect of Soil Temperature, Organic Matter, Soil Moisture, and Amount of Herbicide. *Weeds, 6:24 (1958).* Increasing the temperature from 5° to 45°C increased the percentage retention of monuron in the 2- to 4-inch and 4- to 8-

inch layers of laboratory soil columns. Increasing the organic matter content from 0.87 to 1.44% increased monuron retention from 35 to 95%. Increasing the application rate caused an initial decline in the percentage retention in the 0- to 2-inch layer followed by an increase. The minimum was at a rate of 32 lb/acre.

216. **Wieland, T., Griss, G., and Haccius, B.** Investigations on the Bacterial Oxidation of Benzole. I. Evidence and Chemistry of the Decomposition of Benzole. *Arch. Mikrobiol., 28:383 (1958). W. P. A., 31, 1716.* An organism, isolated from soil, with characteristics similar to certain strains of saprophytic *Mycobacterium* and *Nocardia* decomposed benzole. Decomposition was measured by respiration technique.

217. **Young, W. R., and Rawlins, W. A.** The Persistence of Heptachlor in Soils. *J. Econ. Entomol., 51:11 (1958).* When heptachlor was incorporated into four soil types at the rate of 2 and 4 lb/acre, the soil residue was 26% after 21 months under field conditions. When the insecticide was mixed with soil in the laboratory and then exposed under field conditions in metal containers, the residue was 53% after 21 months.

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218. **Ashton, F. M., and Sheets, T. J.** The Relationship of Soil Adsorption of EPTC to Oats Injury in Various Soil Types. *Weeds, 7:88 (1959).* EPTC evaporates from a free liquid surface at the rate of 57 $\mu g/cm^2/hr$ at 30°C. Soil adsorption is approximately 5 times greater on air-dry soil than on soil at field moisture capacity. Adsorption is directly correlated to increasing clay and organic matter content.

219. **Baines, R. C., Foote, F. J., Stolzy, L. H., Small, R. H., and Garber, M. J.** Factors Influencing Control of the Citrus Nematode in the Field with D-D. *Hilgardia, 29:359 (1959).* Sufficient toxicant was translocated downward through the soil to give 100% kill of citrus nematodes at a depth of 5 feet with injection depths of 3 feet or less.

220. **Burchfield, H. P.** Comparative Stabilities of Dyrene, 1-Fluoro-2,4-Dinitro-Benzene, Dichlone, and Captan in a Silt Loam Soil. *Contrib. Boyce Thompson Inst., 20:205 (1959).* In moist soil the relative stabilities were captan > dichlone > 1-fluoro-2,4-dinitrobenzene > dyrene. The half lives ranged from 3 to 4 days for captan to 0.5 day for dyrene. Soil stability was not correlated with stability in an aqueous buffer solution at pH 7.0.

221. **Burschell, P., and Freed, V. H.** The Decomposition of Herbicides in Soils. *Weeds, 7:157 (1959). Biol. Abstr., 35, 19,608.* Microbial degradation of IPC, CIPC, and amitrole in soil was related to the

Arrhenius equation for the rate constant, and fairly accurate predictions of residual life were obtained.

222. Chisholm, R. D., and Koblitsky, L. Pesticides and Controls: Accumulation and Dissipation of Pesticide Residues in Soil. *Trans. North Am. Wildlife Conf., 24:118 (1959).* A brief review on the accumulation of some common chlorinated hydrocarbon insecticides in soil is given. 14 references.

223. Coggins, C. W., Jr., and Crafts, A. S. Substituted Urea Herbicides: Their Electrophoretic Behavior and the Influence of Clay Colloid in Nutrient Solution on their Phytotoxicity. *Weeds, 7:349 (1959).* Paper electrophoresis showed a net positive charge. The reduction of phytotoxicity in the presence of clay colloid suspension suggests clay adsorption.

224. Creamer, R. M., and Lamont, T. G. Stability of Certain Insecticides in Mixtures with Fertilizers. *J. Agr. Food Chem., 7:107 (1959).* Most mixtures of common chlorinated insecticides and fertilizer were stable at 30°C for at least a month while losses of organic chlorine up to 50% were found after aging for 8 months at the same temperature. Nearly all mixtures were unstable at 100°C, losing up to 20% of their organic chlorine in the first 24 hours.

225. Danielson, L. L. Mode and Rate of Release of Isopropyl N-(3-Chlorophenyl) - Carbamate From Several Granular Carriers. *Weeds, 7:418 (1959).* Contact and vapor toxicity of granular formulations of CIPC decreased as the physical adsorption capacity of the carrier increased. The relative physical adsorption capacity was activated charcoal > vermiculite > perlite > pyrophyllite > uncalcined attapulgite > calcined attapulgite.

226. Day, B. E., Johnson, E., and Dewlen, J. L. Volatility of Herbicides Under Field Conditions. *Hilgardia, 28:255 (1959).* Three relatively low volatile 2,4-D esters and 2,4,5-TP low volatile ester were sufficiently volatile under comparatively high-temperature daytime conditions to cause severe injury to large crop areas surrounding sprayed plots. The 2,4-D acid caused slight injury, and amine salts of 2,4-D caused even less. Amino-triazole did not cause injury outside of the treated plots.

227. Dewey, O. R., and Pfeiffer, R. K. Soil Persistence and Biological Breakdown of 2,3,6-Trichlorobenzoic Acid. *Mededel. Landbouwhogeschool en Opzoekingsstat. Staat Gent, 24:899 (1959).* Phytotoxicity of TBA was greatly reduced in laboratory soil cultures incubated under conditions favorable to microbial activity whereas little or no reduction in phytotoxicity occurred under conditions adverse to microbial activity.

228. Getzin, L. W., and Chapman, R. K. Effects of Soils Upon the Uptake of Systemic Insecticides by Plants. *J. Econ. Entomol., 52:1160 (1959).* From laboratory studies with radioactive phosdrin, it was concluded that adsorption of phosdrin by soil was primarily due to the organic matter content of the soil. The amounts adsorbed were relatively small ranging from 0.031 µg/g for a sandy loam to 1.27 µg/g for a peat. Adsorption of radioactive phorate was approximately double that of phosdrin.

229. Greek, B. F., and Rosenberger, F. E. Design and Construction of a Phosphate Insecticide Plant. *Ind. Eng. Chem., 51:104 (1959). W. P. A., 32, 1,520.* Waste water containing hydrochloric acid, p-nitrophenol, organic phosphate byproducts, organic solvents, and sodium chloride are neutralized in an unlined trench containing limestone; mixed with caustic soda in a concrete-lined tank to hydrolyze parathion (pH 8.0 to 8.5); and retained in concrete holding tanks before discharge to the city sewerage system.

230. Gyrisco, G. G., Muka, A. A., and Briant, A. M. Studies of Flavors and Odors of Potatoes and Red Kidney Beans Grown in Rotation with Lindane-Treated Red Clover. *J. Econ. Entomol., 52:473 (1959).* Lindane was used at 1 lb/acre for two successive seasons followed by 3 years of continuous crops of potatoes or red kidney beans. Potatoes were judged to have "probably" to "strongly" off-flavor and odor while red kidney beans were judged satisfactory.

231. Hemwall, J. B. A Mathematical Theory of Soil Fumigation. *Soil Sci., 88:184 (1959).* A theoretical equation for fumigant movement in soils, with allowance for solution effects, soil adsorption, and chemical reaction, takes the form of Fick's 2d law. A numerical solution indicates 3 stages: (1) radial diffusion, <1 day; (2) transition, 2 to 4 days; and (3) constant loss, lasts until fumigant is dissipated.

232. Jensen, H. L. Biological Decomposition of Herbicides. I. Monochloroacetate, Trichloroacetate, and Dichloropropionate. *Tideskr. Planteavl., 63:470 (1959).* Species of *Pseudomonas, Arthrobacter, Agrobacterium,* and *Trichoderma viride* (fungi) that could degrade these chlorinated aliphatic acids were isolated from soil. A pH below 5.4 and relatively low temperature inhibited action of most species. The latent period was shortened with repeated exposures.

233. Jensen, H. L. Allyl Alcohol as a Nutrient for Microorganisms. *Nature, 183:903 (1959).* Several soil bacteria and strains of the fungus *Tricoderma viride* are able to metabolize allyl alcohol.

234. Lambden, A. E. Fison's Pest Control Ltd. - Trade Effluent Plant. *Inst. Sewage Purif. J. and Proc., Pt. 2, 174 (1959). C. A., 54, 21,564f.* An effluent containing waste from manufacture of herbicides, insecticides, and fungicides is treated in three stages: activated-carbon adsorption, alkaline precipitation of toxic metals, and biological treatment. The 5-day BOD is reduced from about 2,000 to about 20.

235. Lichtenstein, E. P. Absorption of Some Chlorinated Hydrocarbon Insecticides From Soils into Various Crops. *J. Agr. Food Chem., 7:430 (1959).* Soil residues in inorganic soils 3.5 years after treatment were approximately 20, 12, and 9%, respectively, for DDT, lindane, and aldrin. Residues in organic soil were much greater: at 2.5 years the residue was 70% for DDT and 75% for lindane.

236. Lichtenstein, E. P. Factors Affecting Insecticide Persistence in Various Soils. *Pest Control, 27:40 (1959).* The role of organic matter content, soil temperature, application rate, and type of transformation in the soil are discussed in relation to soil persistence. Relatively high organic matter content, low temperature, and high application rate are associated with greater residues.

237. Lichtenstein, E. P., and Polivka, J. B. Persistence of Some Chlorinated Hydrocarbon Insecticides in Turf Soils. *J. Econ. Entomol., 52:289 (1959).* Residues of surface applications to turf soils were as follows: chlordane, 15% after 12 years; BHC, 41% by chemical analysis and 8% by bioassy after 11 years; heptachlor 0% by chemical assay and 5% as heptachlor epoxide by bioassay after 9 years; and aldrin, 8 to 10% as dieldrin after 4 years.

238. Lichtenstein, E. P., and Schulz, K. R. Breakdown of Lindane and Aldrin in Soils. *J. Econ. Entomol., 52:118 (1959).* Lindane residue by bioassay is 46 to 66% of the chemical assay value, indicating a nontoxic breakdown product that is included in the chemical assay. Aldrin is converted to dieldrin as indicated initially by relatively high bioassay results and corroborated by chemical analysis for dieldrin.

239. Lichtenstein, E. P., and Schulz, K. R. Persistence of Some Chlorinated Hydrocarbon Insecticides as Influenced by Soil Types, Rate of Application, and Temperature. *J. Econ. Entomol., 52:124 (1959).* Field studies showed that loss of DDT, lindane, and aldrin was faster in a Miami silt loam than in a muck soil. Relative persistence as determined by chemical assay was DDT > lindane > aldrin. Laboratory studies demonstrated a positive correlation between temperature and insecticide loss of aldrin and heptachlor. There was no loss at all in frozen soil.

240. Magee, L. A., and Colmer, A. R. Decomposition of 2,2-Dichloropropionic Acid by Soil Bacteria. *Can. J. Microbiol., 5:256 (1959).* Eight species capable of decomposing 2,2-dichloropropionate (dalapon) were isolated from soil. The decomposition was demonstrated by four techniques. Six of the species were tentatively identified as *Agrobacterium* and the other two as *Pseudomonas.*

241. Martin, J. P., Harding, R. B., Cannell, G. H., and Anderson, L. D. Influence of Five Annual Field Applications of Organic Insecticides on Soil Biological and Physical Properties. *Soil Sci., 87:334 (1959).*

Studies conducted on two California soils with aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, lindane, and toxaphene applied directly to the soil at recommended application rates did not adversely affect the total number of bacteria or fungi after five annual applications. Fungi species and soil physical properties were also unaffected at the end of the experiment. Residues had reached phytotoxic levels as determined by planting potatoes, beets, and cucumbers after the fifth insecticide application.

242. **Mills, R. E.** Development of Design Criteria for Biological Treatment of an Industrial Effluent Containing 2,4-D Waste Water. *Can. J. Chem. Engr., 37:177 (1959).* Laboratory and pilot plant operation of a trickling filter gave satisfactory oxidation of phenolic waste including dichlorophenol.

243. **Nicholson, H. P.** Insecticide Pollution of Water Resources. *J. Am. Water Works Assoc., 51:981 (1959).* The use of insecticides and their occurrence in natural waters are discussed. Fish kills on 15 tributaries of the Tennessee River in 1950 were attributed to use of insecticides on cotton. DDT concentrations of 0.001 to 0.02 mg/l were detected in Lake St. Clair and the Detroit, Mississippi, Missouri, and Columbia Rivers in 1953 by Public Health Service personnel. A St. Lucie County, Florida, fish kill was caused by dieldrin treatment of a salt marsh.

244. **Phillips, G. F., Dixon, B. E., and Lidzey, R. G.** Volatility of Organomercury Compounds. *J. Sci. Food Agr., 10:604 (1959).* Saturated vapor concentrations were determined by static and dynamic methods for 21 technical or pure compounds at 35°C. Fourteen of these compounds were also run at 25° and 45°C. Some correlation was observed between chemical constitution and vapor pressure. Results are compared to values found in literature.

245. **Phillips, F. T.** Effect of Emulsions and Organic Diluents in Soil Insecticide and Nematocide Formulations. *Nature, 184 (Supp. No. 19): 1512 (1959).* The movement through soil of toxic agents may be markedly affected by use of emulsions and different diluents.

246. **Phillips, W. M.** Residual Herbicidal Activity of Some Chlorosubstituted Benzoic Acids in Soil. *Weeds, 7:284 (1959).* TBA residues were sufficiently persistent to exhibit phytotoxicity 3 years after application. PBA residues were relatively less persistent. The TBA residues had been leached to a depth of 5 feet while the PBA residues were found at the 1- to 2-foot sampling depth.

247. **Press, J. M.** Measurement of Adsorption of Residual Insecticides Using Flowing Chromatography. *Bull. World Health Organization, 20:153 (1959).* Twenty-seven soil columns were perfused with dieldrin, DDT, or gamma BHC in petroleum ether. Dieldrin was adsorbed more strongly by the soils than were DDT or gamma BHC. Adsorption

increased with decreasing particle size. Adsorption was also greater when relatively high iron and aluminum content was combined with low silica content in the soils.

248. Rosen, A. A., and Middleton, F. M. Chlorinated Insecticides in Surface Waters. *Anal. Chem., 31:1729 (1959).* A method of detecting insecticides in water is described. The method employs carbon filter sampling, adsorption chromatography, and infrared spectroscopy. The method has a sensitivity for concentrations of less than 0.01 mg/1.

249. Sheets, T. J. Effects of Soil Type and Time on the Herbicidal Activity of CDAA, CDEC and EPTC. *Weeds, 7:422 (1959).* Relatively high concentrations of CDEC and CDAA were dissipated to nonphytotoxic residues in 1 to 3 months whereas recommended concentrations of EPTC remained phytotoxic for 3 to 4 months. The inactivation rate for EPTC was 3 times greater in nonsterile soil. Initial toxicity of EPTC was highly correlated to organic matter and clay content of the soil.

250. Stevanovic, M., Mlinar, A., and Kangrga, D. Determination of Organophosphorous Poisons. Determination of Malathion in Food and Water. *Vojnosanit. Pregled, 16:307 (1959). C. A. 54, 25347d.* A procedure sensitive to 0.1 mg of malathion based on detection of ethylsuccinate, sulfur, and phosphorous is described.

251. Subra, P., and Gullemot, J. Observations on the Movement of Substituted Urea Herbicides in the Soil. *Fruits (Paris), 14:123 (1959).* The effects of increasing rainfall on leaching of diuron was studied by bioassay procedures. Surface applications of 1.6 and 4.0 kg/ha leached to a maximum depth of 30 mm after addition of about 100 mm of water as a fine spray. Additional water up to 330 mm had little additional effect.

252. Tichennor, D. A., Rodriquez, J. G., and Chaplin, C. E. Effects of Certain Pesticides on Flavor of Frozen Strawberries. *Food Technol., 13:587 (1959).* Twenty-one insecticides, predominately DDT derivatives and organophosphates, and 5 fungicides produced no off-flavor in frozen strawberries even when the fruit was harvested 1 day after treatment.

253. Weber, E. Fertilizers and Insecticides as Causes of Damage to Waters. *Wasser u. Abwasser, p.52:(1959). W.P.A., 34, 1353.* Potential runoff concentrations resulting from heavy rainfall following use of fertilizers or insecticides is discussed. A bioassay procedure is described for detecting insecticides in fish organs.

254. Yeo, R. R. The Adsorption of the Sodium Salt of 2,4-D on Kaolinite, Bentonite and Cellulose. *Univ. Microfilms (Ann Arbor, Michigan) L. C. Card No. Mic. 66-958, 55 pp (1959).* Adsorption of 2,4-D as the sodium salt increased with exposure time up to several hours.

Drying the clays in a desiccator decreased the amount of sodium 2,4-D adsorbed. Total adsorption increased with increasing concentration of 2,4-D, but percent adsorption decreased.

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255. Anon. The Nature and Fate of Chemicals Applied to Soils, Plants, and Animals. *U. S. Dept. Agr., Agric. Res. Service, A. R. S. 20-9 (1960).* This collection of 22 papers, presented at the symposium, includes 4 papers on the persistence and chemical behavior of insecticides, herbicides, and nematocides in soils and plants. These review papers have extensive reference lists.

256. Arndt, F. Influence of Different Properties of the Soil on the Herbicidal Effect of Cyclo-Octyl-Dimethyl-Urea (O.M.U.) *Z. Pflanzenkrankh. u. Pflanzenschutz, 67:25 (1960). Biol. Abs., 44, 8047.* The adsorption of OMU on soil depended on the soil hygroscopicity, the cation exchange capacity, and the soil organic matter content.

257. Bandt, H. J. Poisoning of Streams by Chemical Pest-Control and Weed-Killing Agents. *Wasserwitch. Wasstechn., 10:30 (1960). W.P.A., 35, 556.* The author describes damage to fish caused by the pollution of streams with substances used for the destruction of insects, weeds, and rats, and deals especially with the action of the modern synthetic insecticides. The effects of different substances used are described and their threshold toxic values are given in mg/l. Weed killers that are used not only on land but also in ditches and small streams are dealt with in the same way.

258. Barthel, W. F., Murphy, R. T., Mitchell, W. G., and Corley, C. The Fate of Heptachlor in the Soil Following Granular Application to the Surface. *J. Agr. Food Chem., 8:445 (1960).* Volatilization was identified as an important factor that contributes to the loss of surface-applied heptachlor. Several nonvolatile additives were evaluated for the purpose of reducing this loss.

259. Begg, J. A., Plummer, P. J. G., and Konst, H. Insecticide Residues in Potatoes After Soil Treatment for Control of Wireworms. *Can. J. Plant Sci., 40:680 (1960).* Residues of aldrin, chlordane, dieldrin, and heptachlor in the pulp of early potatoes were $<$ 0.1 ppm. Residues in the peel, washings, and adhering soil were greater. Insecticides had been applied to the soil 3, 15, or 27 months prior to harvesting the crop.

260. Bell, G. R. Studies on a Soil *Achromobacter* Which Degrades 2,4-Dichlorophenoxyacetic Acid. *Can. J. Microbiol., 6:325 (1960).* An *Achromobacter* species, isolated from soil, was capable of oxidizing 2,4-D and many analogs. Requirements for rapid oxidation include a free ortho position (i.e., unchlorinated), two or less chlorine

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substitutions in the ring, a para chlorine substituion, and a free side chain carboxyl group beta to the ether linkage. Possible degradation pathways are evaluated.

261. Bowman, M. C., Acree, F., Jr., and Corbett, M. K. Solubility of C^{14} DDT in Water. *J. Agr. Food Chem., 8:406 (1960).* Trace impurities, adsorption on equipment, and molecular aggregation can influence the results. The solubility in water of DDT, particles < 41 Å, is 1.2 μ g/l at 25°C.

262. Calderback, A. Diquat, A New Herbicide and Desiccant. *Agr. Vet. Chem., 1:197 (1960). C. A., 56, 12032i.* A summary is given of the preparation and chemical and physical properties of diquat (1,1'-ethylene - 2,2'-bipyridinium dibromide).

263. Cohen, J. M., Kamphake, L. J., Lemke, A. E., Henderson, C., and Woodward, R. L. Effect of Fish Poisons on Water Supplies, Part 1, Removal of Toxic Materials, *J. Am. Water Works Assoc., 52:1551 (1960).* The solubilities of toxaphene and rotenone in water at 25°C are 0.4 and 0.17 mg/l, respectively. Both compounds are effectively adsorbed from dilute aqueous solution by activated charcoal.

264. Crafts, A. S., and Drever, H. Experiments with Herbicides in Soils. *Weeds, 8:12 (1960).* The relative rate of loss of phytotoxicity in laboratory studies with 3 California soils was TCA > dalapon > CIPC > CMIPC > TBA > fenuron > monuron. The rate of loss was not affected by differences in soil type.

265. Dujarrie, Reni. Studies on the Interactions Between S-Triazine Herbicides and Soil Bacteria. *Compt. Rend., 250:1555 (1960).* Application rates of simazine, atrazine, propazine, and prometone up to 250 kg/ha had no adverse effect on soil bacteria. With 12 kg/ha application rates, respiration data indicated that soil bacteria may metabolize these s-triazines.

266. Dujarrie, Reni. Interactions Between Simazine and Soil Fungi. *Compt. Rend., 250:1343 (1960).* Simazine at 6 kg/ha had no effect on soil fungi after periods of a few days to 6 months. High application rates are fungicidal and very few species can develop in a simazine-rich environment. Several *Fusarium, Penicillium,* and *Stachybotrys* species utilize the nitrogen but not the carbon of simazine.

267. Edwards, C. A., and Dennis, E. B. Some Effects of Aldrin and DDT on the Soil Fauna of Arable Land. *Nature, 188:767 (1960).* An initial general decline in total population number of soil fauna lasted for about 3 months. This was followed by a general increase in the total number as various groups began to proliferate again.

268. Fowkes, F. M., et al. Clay Catalyzed Decomposition of Insecticides. *J. Agr. Food Chem., 8:203 (1960).* Commercial clay diluents such as Velvex (kaolinite) and Attaclay (attapulgite) catalytically decompose chlorinated hydrocarbon insecticides. The heat evolved from the exothermic reaction may cause spontaneous ignition. The rates of reaction are acidity dependent and treatment of the clays with volatile organic bases diminishes the rate of decomposition accordingly.

269. Frederick, J. F., and Gentile, A. C. A Study of the Effects of 3 Amino-1,2,4-Triazole on Phosphorylase of *Oscillatoria princeps. Arch. Biochem. and Biophys., 86:39 (1960).* Inhibition of phosphorylase by 3 amino-1,2,4-triazole results from chelation of the essential manganous ion. The inhibition can be reversed by addition of ferric ion, indicating a preferential 3-AT-ferric ion complex. Evidence is presented for a 3:1 structure of a ferric chelate of 3 amino-1,2,4-triazole.

270. Gantz, R. L. Persistence and Movement of CDAA and CDEC in Soil and the Tolerance of Corn Seedlings to These Herbicides. *Weeds, 8:599 (1960). C. A., 59, 4488a.* Loss of phytotoxicity of CDAA and CDEC was temperature dependent over the range of 40° to 100°F. Inactivation was complete in 8 weeks at 100°F whereas it was negligible in the same period at 40°F. CDEC was leached much less readily than CDAA.

271. Getzin, L. W., and Chapman, R. K. The Fate of Phorate in Soil. *J. Econ. Entomol., 53:47 (1960).* Radioactive phorate exhibited three types of loss from soil: an initial volatilization of about 25% occurring in the first hour after treatment, strong adsorption on the soil colloid, and partial degradation that appeared to be oxidation to sulfoxide and sulfone.

272. Giebler, G. Studies on the Treatment of Waste Waters of the Pest Control Industry. *Vom Wasser, 25:197 (1958). W. P. A., 33, 9, 1667 (1960).* Coagulation, activated carbon adsorption, extraction with benzole, and distillation were used to reduce the odor and toxicity of waste water from production of hexachlorohexane. It is suggested that activated carbon adsorption, partial distillation, or a combination of both is most suitable. Colored waste water from production of dinitro-o-cresol can be successfully treated by reduction with iron, activated carbon adsorption, chlorination, distillation, or combinations of these methods.

273. Gorter, C. J. Solubilities of Plant-Growth Regulators. *Mededel. Directeur Tuinbouw, 23:300 (1960).* Water solubilities were determined for many plant growth regulators. Some important ones measured in g/l at °C, are p-chlorophenoxyacetic acid, 0.68, 17°; 2,4-D, 0.53, 17°; MCPA, 1.3, 17°; gamma naphthylacetic acid, 0.38, 17°; indole-3-acetic acid, 1.5, 20°; 2,4,5-trichlorobenzoic acid, 0.81, 25°; maleic hydrazide, 2.89, 25°.

274. Gustafson, M. Residues of Pesticides in Crop and Soil. *Kgl. Skogs. - och. Lantbruksakad. Tidskr. Supp. 4, 107 pp (1960).* This extensive review on residues has 567 references.

275. Gysin, H., and Knusli, E. Chemistry and Herbicidal Properties of Triazine Derivatives. *Advances in Pest Control Res., 3:289 (1960).* The water solubility, measured in mg/l, of some triazine derivatives are chlorazine, 9; atrazine, 70; and 6-isopropyl-amino-s-triazine, 260.

276. Hirsch, P. The Detoxification of Weedkillers (Herbicides) by Microorganisms. *Kah-Briefe, Fachgeb., 15:1 (1960). C. A., 55, 8536h.* Dalapon or TCA at 0.1% was decomposed in moist soil incubated at 25° to 30°C for several weeks. Decomposition was determined by chloride release. *Pseudomonas dehalogens* and a *Nocardia* species capable of the degradation were isolated from the soil.

277. Hirsch, P., and Alexander, M. Microbial Decomposition of Halogenated Propionic and Acetic Acids. *Can. J. Microbiol., 6:241 (1960). Pseudomonas* and *Nocardia* species capable of degrading trichloroacetic acid and 2,2-dichloropropionic acid were isolated from soil. Degradation was relatively rapid with 100% of the theoretical chloride release being completed in 3 weeks for several species. Halogen number and position affected the rate as shown by relatively slow degration of beta-substituted propionates.

278. Kincaid, R. R., et al. Effects on Shadegrown Tobacco of Certain Insecticide Residues in the Soil. *Tobacco Sci., 4:201 (1960).* Residues in the soil 5-2/3 years after the application date averaged 25, 24, 13, and 39%, respectively, for DDT, TDE, lindane, and endrin.

279. Koopman, H., and Daams, J. 2,6-Dichlorobenzonitrile - A New Herbicide. *Nature, 186:89 (1960).* The vapor pressure of 2,6-dichlorobenzonitrile is 3 x 10^{-4} mm Hg at 20°C.

280. Lambden, A. E., and Sharp, D. H. Treatment of Effluents from the Manufacture of Weed Killers and Pesticides. *Mfg. Chemist, 31:198 (1960). C. A., 54, 18839e.* Adsorption on activated carbon is used to treat wastewater from pesticide manufacture before discharge to the sewer system or further biological treatment.

281. Leopold, A. C., VanSchaik,P., and Neal,M. Molecular Structure and Herbicide Adsorption. *Weeds, 8:48 (1960).* Increasing chlorination of phenoxyacetic acid decreased its water solubility while increasing its adsorption onto activated carbon.

282. L'hoste, J., and Gerard, J. L. Compatibility of Mineral Carriers and Heptachlor. *Proc. 4th Intern. Congr. Crop Protect., Hamburg, 1957, 2:1193 (1960). C. A., 55, 11744f.* Some mineral carriers used in the preparation of dust or granual formulations catalyze the degradation of the insecticide. The following carriers, in order of increasing catalytic activity, were found to degrade heptachlor: talc, silicates, and kaolin. $CaCO_3$ had no effect on the insecticide. A bioassay method was used to show that diethylene glycol was effective in stabilizing the heptachlor formulations.

283. Lichtenstein, E. P., DePew, L. J., Eshbaugh, E. L., and Sleesman, J. P. Persistence of DDT, Aldrin, and Lindane in Some Midwestern Soils. *J. Econ. Entomol., 53:136 (1960).* Seven soil types located at sites in Ohio, Wisconsin, and Kansas were evaluated at low, intermediate, and high application rates. The relative persistence was DDT > aldrin > lindane. Climate and soil organic matter appear to be important factors that influence insecticide persistence.

284. Lichtenstein, E. P., and Schulz, K. P. Epoxidation of Aldrin and Heptachlor in Soils as Influenced by Autoclaving, Moisture, and Soil Types. *J. Econ. Entomol., 53:192 (1960).* Laboratory and field experiments showed that epoxidation of aldrin and heptachlor were related to moisture content, soil microorganisms, and organic matter content of the soil. After 17 months, approximately 25% of the applied insecticides was recovered as insecticide plus epoxide.

285. Ludwig, R. A., and Thorn, G. D. Chemistry and Mode of Action of Dithiocarbamate Fungicides. *Adv. Pest Control Res., 3:219 (1960).* A detailed discussion is given of chemical reactions that dithiocarbamate compounds undergo with specific emphasis on fungicidal activity.

286. MacPhee, A. W., Chisholm, D., and MacEachern, C. R. Persistence of Certain Pesticides in the Soil and Their Effect on Crop Yields. *Can. J. Soil Sci., 40:59 (1960).* Several pesticides had been applied to the soil in annual increments for 2 to 5 years. This study followed the decline of the soil residue after applications were stopped. After 4 years the percentage of the initial soil residue remaining was DDT, 56; chlordane, 19; BHC, 47; parathion, 21; and arsenic, 100.

287. Menn, J. J., Patchet, G. G., and Batchelder, G. H. The Persistence of Trithion, and Organophosphorous Insecticide in Soil. *J. Econ. Entomol., 53:1080 (1960).* The half life of a 10 μg/g application of trithion in three California soils ranged from 100 to 200 days. Partial sterilization of the soil increased the persistence of trithion. A saturated solution of trithion in distilled water, 0.37 mg/l, was 50% degraded in 115 days.

288. Middleton, F. M., and Lichtenberg, J. J. Measurements of Organic Contaminants in the Nation's Rivers. *Ind. Eng. Chem., 52:99A, (1960).* A preliminary survey employing the carbon filter technique for sample collection followed by liquid extraction, chromatographic separation, and infrared identification disclosed the presence of DDT in four major rivers and aldrin in one major river.

289. Mulla, M. S. Longevity of Insecticides in Soil as Tested Against the Eye Gnat *Hippelates collusor. Mosquito News, 20:376 (1960).* Eight organophosphates mixed with Coachella fine sand, which contained 0.15% organic matter, lost all activity against the eye gnat after 3 to 15 months of storage. Only one organophosphate, Ethion EC-4, maintained activity after 15 months. Two carbamates and thiodan, an organochlorine compound, lost all activity after 6 months.

290. Mulla, M. S. Loss of Chlorinated Hydrocarbon Insecticides from Soil Surface in the Field. *J. Econ. Entomol., 53:650 (1960).* Loss of surface applications exposed at high temperature, a maximum of 120° to 140°F, was determined by bioassay. Endrin, aldrin, and Shell Development Company SD4402 showed more than 50% decrease in activity against eye gnats after 24 hours, whereas DDT showed only 10% loss. Loss of activity of DDT, SD4402, and endrin were similar when tested by mosquito larvae, but aldrin activity was not lost. The behavior of aldrin against mosquito larvae is attributed to conversion of aldrin to dieldrin.

291. Mulla, M. S., and Axelrod, H. Effect of Temperature on Rate of Release of Toxicants From Granules and on Breakdown of Certain Insecticides in Water. *Mosquito News, 20:178 (1960).* Solubility of AC 5727 (m-isopropyiphenyl N-methylcarbamate) in water at 70°F is 3.5 mg/l. Experiments on temperature and time effects showed different results for granular formulations of parathion, Bayer 29493, AC5727, and malathion. AC5727 and malathion showed rapid breakdown at temperatures of 90° and 100°F.

292. Murphy, R. T., and Barthel, W. F. Determination of Heptachlor and Heptachlor Epoxide in Soil. *J. Agr. Food Chem., 8:442 (1960).* Soil residues of heptachlor plus heptachlor epoxide were about 10% of the original surface application 8 months after the application date.

293. Nagasawa, M., Nagamizu, K., Okada, S., and Kimura, I. Formulation of Triazine Derivatives as Herbicide. I. Translocation of Simazine in Soil. *Noyaku Seisan Gijutsu, 1:9 (1960). C. A., 54, 14556h.* The distribution pattern of wettable powder suspensions of simazine in soil was not significantly influenced by varying the surfactant in the powder, through a greater distribution was obtained with anionic surfactants. Greater distribution was also observed for larger soil particles. Simazine, water, and the surfactant were adsorbed separately in soil.

294. Randolph, N. M., Chisholm, R. D., Koblitsky, L., and Gaines, J. C. Insecticide Residues in Certain Texas Soils. *Texas Agr. Exp. St., MP-447, 11 pp (1960).* The relative persistence of single insecticide application rates of 10 or 20 times the normal recommended rates were similar. The average residue after 3 years of normal cropping was DDT, 21%; toxaphene, 19%; dieldrin, 20%; and BHC, 1.5%.

295. Richardson, L. T., and Miller, D. M. Fungitoxicity of Chlorinated Hydrocarbon Insecticides in Relation to Water Solubility and Vapor Pressure. *Can. J. Botany, 38:163 (1960).* Water solubilities in mg/l at 25°C are lindane, 7.3; dieldrin, 0.25; endrin, 0.23; aldrin, 0.20; and methoxychlor, 0.10. Vapor pressures in mm Hg at 25°C are lindane, 9.4×10^{-6}; dieldrin, 1.8×10^{-7}; endrin, 2×10^{-7}; aldrin, 6×10^{-6}; DDT, 1.9×10^{-7}; heptachlor, 3×10^{-4}; and chlordane, 1×10^{-5}.

296. Stringer, G. E., and McMynn, R. G. Three Years' Use of Toxaphene as a Fish Toxicant in British Columbia. *Can. Fish Culturist, 28:37 (1960).* Eight alkaline lakes in British Columbia were treated with toxaphene at concentrations of 0.01 to 0.10 ppm. At all concentrations most of the fish were killed within the first 120 hours. The lakes were still toxic to fish 9 months after treatment. Shrimp were eliminated by all concentrations and were still absent after 9 months.

297. Wheatley, G. A., and Hardman, J. A. The Bioassay of Residues of Insecticides in Soil. *Ann. Appl. Biol., 48:423 (1960).* At application rates of 1, 2, and 3 lb/acre, the dieldrin residues, measured as percentage of amount applied, after 3.5 years were 53, 45, and 37%, respectively.

298. Wheatley, G. A., Wright, D. W., and Hardman, J. A. The Retreatment of Soils with Dieldrin for the Control of Carrot Fly. *Plant Pathol., 9:146 (1960).* Residue data from previous work indicate that the half life of dieldrin is approximately 4 years in a mineral soil and 5 to 7 years in an organic soil.

299. Whiteside, J. S., and Alexander, M. Measurement of Microbiological Effects of Herbicides. *Weeds, 8:204 (1960).* Reduction in the characteristic UV absorption was employed to determine microbial degradation of 2,4-D and 4 (2,4-dichlorophenoxy) butyric acid in solution cultures. 2,4,5-T compounds were resistant to microbial degradation for up to 20 days in similar solution cultures.

300. Woodford, E. K., and Sagar, G. R. Herbicides and the Soil. *Blackwell Scientific Publications, Oxford, England, 88 pp (1960).* The four reviews presented in this book cover microbial degradation, effect of the herbicides on the soil microflora, the physio-chemical aspects of translocation, and factors affecting residue persistence. Each section has an extensive reference list. 338 references.

301. Woodward, R. L. Significance of Pesticides in Water Supplies. *J. Am. Water Works Assoc., 52:1367 (1960).* DDT has been found in rivers in amounts up to 20 ppb, and there have been incidents of fish kills attributed to pesticides entering waters in runoff from lands on which they have been used. Tolerance limits for pesticides on foods have been set; however no official limits have yet been set for concentrations of pesticides in water supplies. Besides their toxicity, a number of the synthetic organic pesticides cause highly objectionable tastes and odors in water.

302. **Yatazawa, M., Persidsky, D. J., and Wilde, S. A.** Effect of Allyl Alcohol on Micropopulation of Prairie Soils and Growth of Tree Seedlings. *Soil Sci. Soc. Amer. Proc., 24:313 (1960).* Treatments in excess of 100 gal/acre caused considerable decrease in the bacterial and actinomycetes population. Treatments of 25 to 200 gallons/acre resulted in rapid proliferation of the fungus *Trichoderma viride.*

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303. **Alexander, M., and Aleem, M. I. H.** Effect of Chemical Structure on Microbial Decomposition of Aromatic Herbicides. *J. Agr. Food Chem., 9:44 (1961).* The effect of molecular structure on the persistence and microbial decomposition of phenoxyalkyl carboxylic acid herbicides, chlorophenols, and some related compounds is presented. The resistance of some aromatic herbicides or their derivatives to microbial degradation is governed by the position of the halogen on the aromatic nucleus and by the linkage and type of aliphatic side chain.

304. **Anon.** Activated Sludge Process Solves Waste Problem. *Chem. Eng., 68:79 (1961). W. P. A., 34, 1321.* Activated-sludge treatment of waste water from the manufacture of parathion reduces the BOD from 4,000 ppm to about 13 ppm and removes 90 to 98% of the phenolic compounds.

305. **Ashton, F. M.** Movement of Herbicides in Soil with Simulated Furrow Irrigation. *Weeds, 9:612 (1961).* Movement of substituted urea and s-triazine herbicides was lateral rather than downward when band applications were followed by furrow irrigation. The three s-triazine moved in direct relation to their relative water solubilities, which are atratone > atrazine > simazine. The order of movement of the substituted ureas was fenuron > monuron > diuron > neburon. The order of movement in relation to soil texture was sandy loam > clay > muck (organic soil).

306. **Banham, F. L.** The Persistence of Certain Soil Insecticides for Control of the Tuber Flea Beetle in the Interior of British Columbia. *Can. J. Plant Sci., 41:664 (1961).* Evaluation was made of periodic insecticide applications to obtain continuous control of the tuber flea beetle by exceeding a certain minimum soil residue. Aldrin, dieldrin, and chlordane are sufficiently persistent in the soil to be suitable for this use.

307. **Barnsley, G. E., and Rosher, P. H.** The Relationship Between the Herbicidal Effect of 2,6-Dichlorobenzonitrile and Its Persistence in Soil. *Weed Res., 1:147 (1961).* The persistence of 2,6 DBN after

surface application is short under both tropical and temperate (winter) conditions. Enhancement of persistence by mechanical incorporation or by simulated rainfall after application is attributed to reduction in vapor loss since 2,6 DBN has a relatively high vapor pressure of 5.4×10^{-4} mm Hg at 20°C and is relatively insoluble in water, 20 ppm at 25°C. It appears that chemical or microbiological degradation in the soil is relatively slow.

308. Bogan, R. H., Okey, R. W., and Vargas, D. J. Pesticides in Natural Waters. *Research (London), 14:269 (1961). W. P. A., 36, 354.* Use trends, application practices and toxicological findings, and biological degradation in water are discussed in separate sections. There are about 30 compounds that account for 80 to 90% of the total pesticide usage. The chlorinated hydrocarbon insecticides undergo only limited chemical change and substantially no biochemical degradation in water. Inclusion of chlorine or phosphorous in a molecule markedly increases resistance to biological degradation whereas sulfur can be substituted for oxygen with little effect.

309. Bollen, W. B. Interactions Between Pesticides and Soil Microorganisms. *Ann. Rev. Microbiol., 15:69 (1961).* An extensive review of 141 literature references on the interactions between pesticides and soil microorganisms is presented in sections on fungicides and fumigants, herbicides, insecticides, and inorganic pesticides. The most generally reported interactions for fungicides and fumigants were the inhibition of nitrification for a considerable period of time and the domination of the rejuvenated fungal population by *Trichoderma viride.* In general at normally used field application rates, herbicides do not adversely affect the soil microorganisms or their normal metabolic processes. Nearly all herbicides commonly used or being tested for use are attacked in varying degrees by the soil microorganisms. Insecticides showed little evidence of inhibitory effects and virtually no evidence of microbial degradation.

310. Bonn, E. W., and Halbert, L. R. Some Effects of Rotenone Products on Municipal Water Supplies. *Trans. Am. Fisheries Soc., 90:287 (1961).* Treatment of portions of Lake Lavon and Boham State Park Lake in Texas with five different rotenone products produced undesirable taste and odor in treated waters. Activated carbon, at the rate of 1.0 ppm for each threshold odor number produced, successfully reduced the undesirable taste and odor. Spring and fall were found to be the best time for lake treatment in Texas.

311. Bridges, W. R. Disappearance of Endrin from Fish and Other Materials of a Pond Environment. *Trans. Am. Fisheries Soc., 90:332 (1961).* Dissipation of endrin after accidental contamination of a pond showed that endrin could not be detected in the water after about 1 month, in the pond vegetation after 1.5 months, in the bottom mud after about 2 months, and in fish after less than 3 months. Contamination occurred in a small area of the pond, and dilution played an unknown role in the disappearance rate.

312. **Burnside, O. C., Schmidt, E. L., and Behrens, R.** Dissipation of Simazine from the Soil. *Weeds, 9:477 (1961).* Simazine can be inactivated by high temperature, > 212°F, or low pH, < 4.0. Loss by volatilization is negligible. Under normal use conditions, the factors contributing to inactivation are plant uptake, microbial degradation, and leaching. Simazine is leached very slowly, and microbial degradation is relatively slow, 90% degradation after 10 months incubation at 85°F.

313. **Burschel, P.** Experiments on the Breakdown of Simazine in Soil. *Weed Res., 1:131 (1961).* The degradation rate of simazine in soil is highly dependent on temperature and organic matter content of the soil. Simazine is not readily leached downward in the profile, but the penetration is greater in sandy soil than in clay soil.

314. **Chandra, Purna, and Bollen, W. B.** Effects of Nabam and Mylone on Nitrification, Soil Respiration, and Microbial Numbers in Four Oregon Soils. *Soil Sci., 92:387 (1961).* Both chemicals adversely affected nitrification for a period of more than 60 days. Except for this temporary suppression of nitrification, the compounds had no other observed influence.

315. **Cohen, J. M., Pickering, Q. H., Woodward, R. L., and Heuvelen, W. V.** Effect of Fish Poisons on Water Supplies. Part 3. Field Study at Dickinson. *J. Am. Water Works Assoc., 53:233 (1961).* Toxic and odorous components resulting from an average treatment of 2.0 mg/l with a commercial fish poison were successfuly reduced to desirable levels at the water treatment plant by adding activated carbon at 61 mg/l. Toxic components could not be detected in the raw water after 3 days and odor components were dissipated after 6 days.

316. **Cohen, J. M., Rourke, G. A., and Woodward, R. L.** Effect of Fish Poisons on Water Supplies. Part 2. Odor Problems. *J. Am. Water Works Assoc., 53:49 (1961).* Toxaphene and rotenone have threshold odor concentrations of 0.0052 and 13.8 mg/l, respectively. Four commercial rotenone formulations had threshold odor concentrations of 0.007 to 0.023 due to the solvent used. Removal of odor-producing residues requires a much larger dose of activated carbon than removal of the toxic component.

317. **Comes, R. D., Bohmont, D. W., and Alley, H. P.** Movement and Persistence of Endothal (3,6 Endoxohexahydrophthalic Acid) as Influenced by Soil Texture, Temperature, and Moisture Levels. *J. Am. Soc. Sugar Beet Technol., 11:287 (1961).* Endothal is easily translocated in soil by water movement. Inactivation in moist soil was temperature dependent. The inactivation rate above 20°C is rapid, being nearly complete after 7 days.

318. Cope, O. B. Effects of DDT Spraying for Spruce Budworm on Fish in the Yellowstone River System. *Trans. Amer. Fisheries Soc., 90:239 (1961).* DDT sprayed on approximately 72,000 acres of the Yellowstone River basin at 1 lb/acre produced the following results on streams: DDT up to 0.03 ppm was detected in streams and was detected as much as 55 miles downstream, stream vegetation contained up to 2.3 ppm DDT, and one lake sample of water contained 0.5 ppm DDT.

319. Cronshey, F. H. A Review of Experimental Work with Diquat and Related Compounds. *Weed Res., 1:68 (1961).* Published literature on diquat 9,10-dihydro-8a, 10a-diazonio phenanthrene dibromide (or 1,1-ethylene-2,2-dipyridylium dibromide) and related dipyridyl herbicides is reviewed. Referring to unpublished data, the author states that diquat is rapidly and completely adsorbed on soil by ion exchange.

320. Danielson, L. L., Gentner, W. A., and Jansen, L. L. Persistence of Soil-Incorporated EPTC and Other Carbamates. *Weeds, 9:463 (1961).* Application rate, temperature, solvent-carrier, irrigation, and surfactants were evaluated as factors influencing the soil persistence of several carbamate herbicides.

321. Day, B. E. Formulation of Dalapon to Reduce Soil Contamination. *Weed Res., 1:177 (1961).* The use of volatile formulations and film-forming carriers were evaluated as methods of reducing the transfer of vegetative sprays to the soil by precipitation. The glycol ester (diethyleneglycol bis ester) with an evaporation rate of 1 kg/ha/hour at 20°C shows promise as a volatile formulaton. Polyvinylacetate emulsion forms a dry film that causes only a minor reduction in herbicidal activity.

322. Day, B. E., Jordan, L. L., and Hendrickson, R. T. The Decomposition of Amitrole in California Soils. *Weeds, 9:443 (1961).* Adsorption of amitrole by 55 California soils was easily reversible and rarely exceeded 50%. Steam sterilization reduced the degradation rate, which suggested a microbial metabolism. Degradation rate was also temperature dependent with a maximum at 20° to 30°C. The degradation rate was not dependent on soil properties, but it was generally greater in more highly evolved finer-textured soils.

323. Fang, S. C., Theisen, P., and Freed, V. H. Effects of Water Evaporation, Temperature, and Rates of Application on the Retention of Ethyl-N-N-di-N-Propylthiocarbamate in Various Soils. *Weeds, 9:569 (1961).* EPTC labeled with S^{35} is apparently strongly adsorbed by dry soil. In wet soil the loss of EPTC is reduced as the organic matter content and/or the clay content of the soil is increased.

324. Fletcher, W. W. Effect of Organic Herbicides on Soil-Micro-Organisms. *Pest Technol., 3:272 (1961).* A review is presented of interactions between organic herbicides and soil microorganisms with particular emphasis on the nitrogen-cycle organisms. Data are presented individually for several types of compounds. A common effect is a temporary inhibition followed by an increase in total number. The nitrifying bacteria appear to be the most sensitive of soil microorganisms.

325. **Freed, V. H., and Furtick, W. R.** The Persistence of Amitrole in Soil When Used for Chemical Fallow. *Hormolog, 3:3 (1961).* Studies on the persistence of amitrole in field trails at several sites in Oregon are reported. Analyses were made by the method of K. A. Sund with slight modifications. Applications at the rate of 1 and 2 lb/acre made in the winter months showed no detectable residue in the 0- to 6-inch and 6- to 12-inch soil layers from as little as 2 months up to 6 months after the application date.

326. **Gallaher, P. J., and Evans, L.** Preliminary Investigation on the Penetration and Persistence of DDT Under Pasture. *New Zealand J. Agr. Res., 4:466 (1961).* DDT applications of 1, 2, 4, and 8 lb/acre applied as a fertilizer-herbicide top dressing to a silt loam remained concentrated in the surface soil. Approximately 50% of all application rates remained as a residue after 1 year.

327. **Gerolt, P.** Investigation Into the Problem of Insecticide Sorption by Soils. *Bull. World Health Organization, 24:577 (1961).* The influence of relative humidity on soil adsorption of DDT and dieldrin is investigated in laboratory experiments. Both extremely high and extremely low relative humidity inhibits the translocation of insecticide into the soil block; maximum translocation is at an intermediate humidity.

328. **Harris, C. R., and Lichtenstein, E. P.** Factors Affecting the Volatilization of Insecticidal Residues trom Soils. *J. Econ. Entomol., 54:1038 (1961).* In laboratory studies soils treated with aldrin, heptachlor, phorate, lindane, heptachlorepoxide, or dieldrin gave off toxic vapors whereas soils treated with DDT, sevin, malathion, or parathion did not. Aldrin- and heptachlor-treated field plots continued to release toxic vapors 1 year after treatment. Laboratory studies showed that toxicant concentration, soil moisture, soil temperature, air movement, and soil composition are factors that influence the volatilization rate of aldrin.

329. **Jensen, H. L.** Some Aspects of Biological Allyl Alcohol Dissimulation. *Acta. Agr. Scand., 11:54 (1961). Pseudomonas fluorescens* and *Nocardia corallina* oxidized allyl alcohol by means of inducible enzymes with the formation of acrylic acid as one intermediate.

330. **Jensen, H. L.** Biological Decomposition of Herbicides in the Soil. 2. Allyl Alcohol. *Tidssk. Planteavl., 65:185 (1961).* Allyl alcohol

was more rapidly detoxified in biologically active soils. Application rates of 0.2 to 1.0 ml/kg were detoxified in 4 to 8 days. *Pseudomonas fluorescens, Norcardia corallina,* and *Trichoderma viride* plus a few *Azotobacter* species were identified as being capable of detoxifying allyl alcohol.

331. Kretchmer, H. The Decomposition of Chlorate Herbicides in the Mud of Ditches. *Albrecht-Thaer-Arch., 5:236 (1961). C. A., 58, 11,904e.* Three chlorate herbicides, anforstan (68.1% ClO_3^-), agrosan (78.4% ClO_3), and wegerein (79.5% ClO_3^-), were decomposed quite rapidly in soil. Sixty days after application of 0.5 mg of anforstan, wegerein, and agrosan per g of soil, the residues were 37, 22, and 6% respectively. No detectable amounts of chlorate of Cl were adsorbed by the soil, and it was concluded that the degradation products were removed in the liquid phase. (from Weed Abstr., 10, 1454, 1961.)

332. Lichtenstein, E. P., and Schulz, K. R. Effect of Soil Cultivation, Soil Surface and Water on the Persistence of Insecticidal Residues in Soils. *J. Econ. Entomol., 54:517 (1961).* Laboratory studies indicated that water displaced aldrin from surface adsorption sites on soil with subsequent loss by volatilization. In laboratory work DDT loss was not affected by the amount of water evaporated for soil or glass surfaces. In a field experiment daily disking of treated plots significantly reduced residues in comparison to fallow controls. After 4 months DDT and aldrin residues in the controls were 74 and 47%, respectively, while comparable values for disked plots were 56 and 29%.

333. Ludzack, F. J., and Mandia, J. W. Behavior of Amitrole in Surface Water and Sewage Treatment. *Proc. 16th Ind. Waste Conf., Purdue Univ. Engng. Ext. Ser. No. 109, 540 (1962).* There was no measurable degradation of amitrole by biologic action in river water, sewage, activated sludge, or anaerobic digestion tests. Amitrole interferred with nitrification in river water and activated sludge tests. Inhibition of anaerobic digestion was less than in aerobic systems, but there was no measurable degradation. Chlorination degraded amitrole to unidentified compounds.

334. Massini, P. Movement of 2,6-Dichlorobenzonitrile in Soils and in Plants in Relation to Its Physical Properties. *Weed Res., 1:142 (1961).* The movement of the herbicide (2,6-dichlorobenzonitrile) in soils and in plants is shown to be governed mainly by its high volatility (vapor pressure = 5×10^{-4} mm Hg at 20°C), low water solubility (18 ppm at 20°C), and by its strong adsorption on humus, lignin, and lipid material. In greenhouse studies diffusion of 2,6-dichlorobenzonitrile was 7 cm in a sand and 2 cm in a clay (dry columns). Some evidence for the transformation (i.e., degradation) of 2,6-dichlorobenzonitrile by plants was presented.

335. Mitchel, L. C. The Effect of Ultraviolet Light (2537 Å) on 141 Pesticide Chemicals by Paper Chromatography. *J. Assoc. Offic. Agr. Chemists, 44:643 (1961).* Irradiation of a 10 μg quantity of a pesticide spotted on filter paper resulted in one of three effects: (1) little or no change, (2) complete degradation, or (3) partial degradation. Of the 141 chemicals tested, 91 showed partial or complete degradation. Pesticides that are not degraded include aminotriazole, aramite, BHC and its isomers, 2,4-D-acid, dalapon, dinitro insecticides, diuron, and dipterex.

336. Mulla, M. S., Georghiou, G. P., and Cramer, H. W. Residual Activity of Organophosphorus Insecticides in Soil as Tested Against the Eye Gnat, *Hippelates collusor. J. Econ. Entomol., 54:865 (1961).* Trithion, diazinon, Bayer 25141, co-ral, ethion, GC-4072, and ethyl guthion show appreciable residual activity after 6 to 8 months when applied at 4 to 8 lb/acre. Bayer 22408, phorate, American Cyanamid experimental nematocide 18133, GC-3583, and GC-3582 showed residual activity at 2 months, but not at 6 months when applied at 8 to 16 lbs/acre. Methyl trithion, Bayer 29493, guthion, di-syston, ronnel, dimethoate, parathion, and Bayer 22684 did not show residual activity after 2 months of storage. The experiments were conducted with Coachella fine sand containing 0.15% organic matter.

337. Munnecke, D. E. Movement of Nonvolatile, Diffusible Fungicides Through Soil Columns. *Phytopathology, 51:593 (1961).* All 13 of the nonvolatile fungicides used could be completely leached from 3 soils. Movement was controlled by factors that influence water movement in soils. Solution formulations, such as nabam, moved more readily than suspensions, such as captan. Movement was decreased as the organic matter content of the soil increased.

338. Purakayastha, M., and Nandi, P. Studies on the Decomposition of Crag Herbicide and Its Effect on the Soil Microflora. *Trans. Bose Research Inst. Calcutta, 24:219 (1961). Biol. Abstr., 43, 11747.* Crag herbicide at 0.1 mg/g was stimulatory to most soil microorganisms when incubated for 10 days at 30°C and 20% moisture. One exception was the complete inhibition of the nitrification process.

339. Ragab, M. T. H., and McCollum, J. P. Degradation of C^{14} Labeled Simazine by Plants and Soil Microorganisms. *Weeds, 9:72 (1961).* Experiments with sterile and nonsterile soils indicate that microorganisms play an active role in the degradation of simazine in soil.

340. Roadhouse, F. E. B., and Birk, L. A. Penetration of and Persistence in Soil of the Herbicide 2-Chloro-4,6-Bis(Ethylamino)-S-Triazine (Simazine). *Can. J. Plant Sci., 41:252 (1961).* Average soil residues from application rates of 0.5 to 20 lb/acre are 3 months, 35%; 1 year, 8%; and 2 years, 3%. Detectable residues were confined to the surface soil with only a negligible penetration below the 4-inch depth.

341. Rogoff, M. H. Oxidation of Aromatic Compounds by Bacteria. *Advances in Appl. Microbiol., 3:193 (1961).* Literature on the microbial degradation of aromatic compounds including the 2,4-dichlorophenoyxacetic acid herbicides is reviewed. Schematic diagrams are presented for proposed metabolic pathways.

342. Spiller, D. A Digest of Available Information on the Insecticide Malathion. *Advances in Pest Control Res., 4:249 (1961).* An extensive review is presented of malathion literature: its use, plant residues, and taste and odor production in vegetable crops. The unpleasant odor of technical products is caused by an impurity. The water solubility of malathion is 145 mg/l and its vapor pressure is 4 x 10^{-5} mm Hg at 30°C. 658 references.

343. Swezey, A. W., and Nex, R. W. Some Chemical and Physical Properties of Weed Killers, Supplement 1. *Weeds, 9:209 (1961).* Water solubility and vapor pressure are among the several chemical and physical properties that are listed for 80 compounds.

344. Taschenberg, E. F., Mack, G. L., and Gambrell, F. L. DDT and Copper Residues in a Vineyard Soil. *J. Agr. Food Chem., 9:207 (1961).* Two vineyards on a gravelly loam were investigated for accumulation of DDT in the soil after extended periods of annual DDT treatments averaging about 6 lb/acre/year. After 6 years the accumulation of DDT was about 18 lb/acre in the 0- to 3-inch soil layer. After 12 years, 27 lb/acre of DDT had accumulated in the 0- to 3-inch soil layer. Less than 10% of the total residue in the 0- to 6-inch layer had penetrated below the 3-inch depth.

345. Vorob'ev, F. K., and Ch'a, Ju-Pi. Persistence of the Toxic Effect of Simazine Introduced into the Soil. *Dokl. Mosk. Sel'skokhoz. Akad., No. 64, 91 (1961). C. A., 58, 3835a.* The persistence of phytotoxic residues of simazine varies with soil type, moisture content of the soil, surrounding temperature, application rate, and plant species used for detection. Simazine at 4 kg/ha was still phytotoxic to rye after 4 years whereas no phytotoxicity to cultivated crops was detected at 2 kg/ha.

346. Walker, T. R. Ground-Water Contamination in the Rocky Mountain Arsenal Area, Denver, Colorado. *Bull. Geol. Soc. Amer., 72:489 (1961).* The contamination originated from a waste basin that held chlorate from 1943 to 1950 and 2,4-D-type compounds from 1950 to 1957. The chlorate pollution has migrated about 5 miles and the 2,4-D-type compound pollution has migrated about 3.5 miles. Dilution by increasing area, natural recharge with uncontaminated water, and other factors have not reduced the concentrations to nonphytotoxic levels.

347. Weidhass, D. E., Bowman, M. C., and Schmidt, C. H. Loss of Parathion and DDT to Soil from Aqueous Dispersions and Vermiculite Granules. *J. Econ. Entomol., 54:175 (1961).* Both P^{32} parathion and C^{14} DDT are strongly adsorbed from aqueous dispersions by soil. After 24 hours soil adsorption of DDT was 80% for both 100 ml and 250 ml volumes of water whereas soil adsorption of parathion was 63% from the 100 ml volume and 38% from the 250 ml volume.

348. Weldon, L. W., and Timmons, F. L. Photochemical Degradation of Diuron and Monuron. *Weeds, 9:111 (1961).* Diuron and monuron were photochemically degraded when irradiated with an 85-watt UV lamp. Absorption spectra of monuron near 245 mμ and of diuron near 249 mμ were most affected by irradiation. Diuron appeared to break down more rapidly than monuron when determined spectrophotometrically. Irradiation under the 85-watt UV lamp for a 28-hour period caused a 75% decrease in biological toxicity for both.

349. Weldon, L. W., and Timmons, F. L. Penetration and Persistence of Diuron in Soil. *Weeds, 9:195 (1961).* Frequent irrigation for more uniform and higher soil moisture content increased the rate of detoxification of diuron.

350. Werner, A. E., and Waldichuk, M. Decay of Hexachlorocyclohexane in Sea Water. *J. Fisheries Research Board Can., 18:287 (1961).* The relative decay rates in sea water for the 3 isomers tested were gamma > beta > alpha. Comparison of results for millipore-filtered (nearly sterile) and unfiltered sea water indicate the decay is a chemical reaction. A relatively high apparent gamma hexachlorocyclohexane concentration remained after 12 months of storage at 20°C.

351. Westlake, W. E. Pesticides. *Anal. Chem., 33:88P (1961).* The literature on pesticide analysis from November 1958 to October 1960, including 58 references, is reviewed.

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352. Bishop, R. F., and Chisholm, D. Arsenic Accumulation in Annapolis Valley Orchard Soils. *Can. J. Soil Sci., 42:77 (1962).* Total arsenic in 25 representative Annapolis Valley, Nova Scotia, apple orchards ranged from 9.8 to 124.4 ppm compared with a range of a trace to 7.9 ppm for comparable nonorchard land.

353. Burger, K., MacRae, I. C., and Alexander, M. Decomposition of Phenoxyalkyl Carboxylic Acids. *Soil Sci. Soc. Amer. Proc., 26:243 (1962).* Several 3,4-dichloro- and 2,4,5-trichlorophenoxy-carboxylic acids exhibited prolonged phytotoxicity in soil. The persistence of phytotoxicity of similar 2,4-substituted phenoxycarboxylic acids was governed by the type and attachment position of the aliphatic acid side chain. A *Flavobacterium* species isolated from the soil was capable of metabolizing only phenoxybutyric acids having no meta chlorine substitution in the ring.

354. Castelfranco, P., and Deutsch, D. B. Action of Polysulfide Ions on Simazine in Soil. *Weeds, 10:244 (1962).* In soil, calcium polysulfide accelerates the loss of simazine phytotoxicity to oats. Aqueous solutions of sodium and calcium polysulfides convert simazine to a chloroform insoluble, charcoal adsorbable derivative believed to be hydroxysimazine.

355. Dewey, O. R., Lyndsay, R. V., and Hartley, G. S. Biological Destruction of 2,3,6-Trichlorobenzoic Acid in Soil. *Nature, 195:1232 (1962).* The degradation of TBA in biologically active soil was demonstrated with the use of Cl^{36} tagged TBA. Up to 50% of the Cl^{36} was recovered as ionic chloride within 5 months.

356. Eno, C. F. The Effect of Simazine and Atrazine on Certain of the Soil Microflora and Their Metabolic Processes. *Soil and Crop Sci. Soc. Florida Proc., 22:49 (1962).* Laboratory studies indicate that normally used application rates of simazine and atrazine do not significantly affect carbon dioxide production, nitrate production, or relative numbers of fungi and bacteria. At excessively high rates, 4,000 to 8,000 ppm, nitrate production was drastically reduced in soil and fungi were essentially eliminated from solution cultures.

357. Faust, S. D., and Aly, O. M. Determination of 2,4-Dichlorophenol in Water. *J. Am. Water Works Assoc., 54:235 (1962).* The procedure employs acid extraction with petroleum ether and color development with 4-aminoantipyrine at an ammonium hydroxide-phosphate buffered pH of 8.0 The method has a sensitivity of 7 μg/l and a range of 0 to 1,000 μg/l.

358. Fischer, A. 4-Amino-5-Chloro-1-Phenyl-6-Pyridazone (PCA) as a New Herbicide for Sugar Beet. *Weed Res., 2:177 (1962).* This compound has a melting point of 202°C, a vapor pressure of 0.074 mm Hg at 40°C, and a water solubility of 0.3 g/l at 20°C.

359. Freed, V. H., Vernetti, J., and Montgomery, M. The Soil Behavior of Herbicides as Influenced by Their Physical Properties. *Proc. Western Weed Control Conf., 19:21 (1962).* A detailed discussion of physiochemical interactions and properties for a number of herbicides, including data on volatilization, adsorption, solubility, photochemical degradation, and biological degradation. 60 references.

360. Frissel, M. J., and Bolt, G. H. Interaction Between Certain Ionizable Organic Compounds (Herbicides) and Clay Minerals. *Soil Sci., 94:284 (1962).* The adsorption of several herbicides by clays in aqueous environment was studied by determining adsorption isotherms under various conditions. The main variables of concern proved to be the pH and electrolyte concentration of the system.

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361. Gast, A. Contributions to the Knowledge of the Behavior of Triazine Herbicides in the Soil. *Mededel. Landbouwhogeschool en Opzoekingsstas. Staat Gent, 27:1252 (1962).* Simazine is strongly adsorbed by activated charcoal. Strongly dissociating carriers in granulated formulations inhibit soil adsorption of simazine allowing greater translocation to deeper soil layers. Ultraviolet and infrared irradiation reduce toxicity of surface applied simazine.

362. Gysin, H. Triazine Herbicides - Their Chemistry, Biological Properties, and Mode of Action. *Chemistry & Industry, 31:1393 (1962).* The water solubility of several s-triazines are simazine, 5 mg/l; propazine, 10 mg/l; atrazine, 70 mg/l; and prometone, 750 mg/l.

363. Hall, D. G. Use of Insecticides in the United States. *Bull. Entomol. Soc. Am., 8:90 (1962).* The yearly average of 225,000,000 pounds of active ingredient are applied on 90,000,000 acres (about 4.5% of the total land area). Of the total, 25% is used in urban areas. Cotton, orchard crops, and cereal grain crops account for 85% of the 165,000,000 pounds used for agricultural purposes.

364. Hills, F. J., and Leach, L. D. Photochemical Decomposition and Biological Activity of Sodium p-Dimethyl Aminobenzenediazosulfonate (Dexon). *Phytopathology, 52:51 (1962).* Exposure of dexon to white light resulted in decolorization followed by formation of a pink color. The photochemical transformation is accompanied by loss of fungistatic activity.

365. Hinden, E., Hatten, M. J., May, D. S., Jr., Skrinde, R. T., and Dunstan, G. H. Analysis of Synthetic Organic Pesticides in Water. *J. Am. Water Works Assoc., 54:88 (1962).* A procedure combining paper chromatography, enzymatic methods, and gas chromatography is presented for separation and quantitative determination of chlorinated organics and organophosphate pesticides.

366. Hughes, J. T. Preliminary Observations on the Conversion of Sodium N-Methyl Dithiocarbamate (Metham-Sodium) to Methyl Isothiocyanate in Soil. *Ann. Rept. Glasshouse Crops Res. Inst., 108 (1959). Weed Abstr., 11, 259.* The conversion of SMDC to isothiocyanate in air-dry nonsterile soil was determined from adsorption spectra analysis. A concentration of 20 mg of SMDC per l was reduced to 0.18 mg/l in 45 minutes. The conversion appeared to result from the direct action of soil solids, for little methyl isothiocyanate was formed in soil extracts.

367. Kakehashi, T. Diffusion of Nemafume 30 (EDB) in Soil. *Noyaku Seisan Gijutsu, 1:29 (1960). C. A., 56, 1805e.* 1,2-dibromoethane injected into soil at 18° or 25°C rapidly moved laterally and downward whereas in soil at 12°C it diffused very slowly in all directions.

368. **Kallman, B. J., Cope, O.B., and Navarre, R.J.** Distribution and Detoxification of Toxaphene in Clayton Lake, New Mexico. *Trans. Am. Fisheries Soc., 91:14 (1962).* The fate of toxaphene added to Clayton Lake, New Mexico, was followed over a 1.5-year period. Water concentrations of toxaphene were higher in leeshore than windward samples for 2 weeks after application. There appeared to be a rapid initial loss, a matter of hours, followed by a long persistence, 250 days, of a very low concentration of about 0.001 ppm. Total applied was 0.05 ppm.

369. **Lichtenstein, E. P., Mueller, C. H., Myrdal, G. R., and Schulz, K. R.** Vertical Distribution and Persistence of Insecticidal Residues in Soils as Influenced by Mode of Application and a Cover Crop. *J. Econ. Entomol., 55:216 (1962).* Field studies with aldrin and heptachlor demonstrated that incorporation of the insecticide into the soil and use of a dense cover crop, alfalfa, increased soil residues. Incorporation into the soil caused a tenfold increase in soil residue in samples taken 4 months after application. Three years after application aldrin residues, as aldrin plus dieldrin, were 19 and 36%, respectively, for open plots and alfalfa cover crop plots.

370. **Mahoney, C. H.** Flavor and Quality Changes in Fruits and Vegetables in the United States Caused by Application of Pesticide Chemicals. *Residue Reviews, 1:11 (1962).* This is a review article citing data for 61 commercial pesticide chemicals. 37 references.

371. **Miles, J. W., Pearce, G. W., and Woehst, J. E.** Stable Formulations for Sustained Release of DDVP. *J. Agr. Food Chem., 10:240 (1962).* Promising solid formulations for slow release of DDVP vapors include formulations with montan wax and hydrogenated cottonseed oil or phthalic acid esters.

372. **Murphy, R. T., Barthel, W. F., and Lufgren, C. S.** Residual Studies in Connection with Successive Applications of Heptachlor for Imported Fire Ant Eradication. *J. Agr. Food Chem., 10:5 (1962).* Heptachlor residues from two 0.25 lb/acre applications at 4 or 8 month intervals equalled the residue from a single 1.0 lb/acre application made at the time of the first 0.25 lb/acre application. The sampling date was 10 months after the initial application date.

373. **Nicholson, H. P., Webb, H. J., Lauer, G. J., O'Brien, R. E., Grzenda, A. R., and Shanklin, D. W.** Insecticide Contamination in a Farm Pond. *Trans. Am. Fisheries Soc., 91:213 (1962).* The contamination of a farm pond receiving runoff from a peach orchard and truck crop land is discussed in detail. The insecticide parathion was identified in concentrations ranging from 0.23 to 1.7 ppm in the soil. It reached a maximum concentration of 1.22 ppb in the farm pond water.

374. **Orlovsky, V. M.** Maximum Permissible Concentration of Chlorocyclohexane in Water Basins. *Gigiena i Sanit., 27:24 (1962). W.P.A., 36, 997.* In experiments on the effect of chlorocyclohexane in water basins, its solubility in water was established as 500 mg/l. The threshold odor concentration is 0.05 mg/l. Concentrations up to 10.0 mg/l have no effect on the DO, self-purification, or mineralization processes of water. It is recommended that the maximum permissible concentration in water should be 0.05 mg/l.

375. **Petrosini, G.** Natural Degradation of Dithiocarbamates (Fungicides). *Notiz. Malatte Piante (Italy), No. 59—60, 59 (1962). C. A., 57, 8957f.* Degradation of zineb (I) and ziram (II) in the field causes decrease in CS_2 produced by acid hydrolized at 100°C. Laboratory experiments show (I) degrades to ethylene thiuram monosulfide and this to ethylene thiourea. Presence of moisture accelerates decomposition of (I), but high temperatures have little influence except in presence of moisture. (II) shows little degradation compared to (I) under same conditions. Decomposition of (I) is increased by admixture of insoluble Cu fungicides at high temperature and moisture, but Cu has little effect on (II).

376. **Rauser, W. E., and Switzer, C. M.** Factors Contributing to the Loss of Amiben Phytotoxicity in Soils. *Weeds, 10:62 (1962).* Water soluble amiben is easily leached downward in sand, but is adsorbed by the soil colloid in clay and organic soils. Microbial metabolism appears to be a factor in the degradation of amiben.

377. **Reynolds, H. T., and Metcalf, R. L.** Effect of Water Solubility and Soil Moisture Upon Plant Uptake of Granulated Systemic Insecticides. *J. Econ. Entomol., 55:2 (1962).* The water solubility of several organophosphates in mg/l are di-syston, 66; phorate (Thimet), 85; sulfoxide of di-syston, 100; Dimethoate, 20,000; and O.S.-1836 (diethyl-2-chlorovinylphosphate), miscible. Movement in the soil is directly related to water solubility.

378. **Reynolds, T. D.** Pollutional Effects of Agricultural Insecticides and Synthetic Detergents. *Water & Sewage Works, 109:352 (1962).* A review and discussion of pollutional effects of pesticides is presented. 19 references.

379. **Riepma, P.** Preliminary Observations on the Breakdown of 3-Amino-1,2,4-Triazole. *Weed Res., 2:41 (1962).* In the Netherlands, with the use of several soil types and the use of temperature, soil sterilization, and microbiological toxicants as variables, it was demonstrated that amitrole (3 amino-1,2,4-triazole) is broken down microbiologically in soil. Both increases in the organic-matter content of the soil and in the temperature up to 30°C increased the rate of breakdown.

380. Roberts, J. E., Chisholm, R. D., and Koblitsky, L. Persistence of Insecticides in Soil and Their Effects on Cotton in Georgia. *J. Econ. Entomol., 55:153 (1962).* The persistence of BHC, DDT, guthion, and malathion in an Appling sandy loam soil in the field was studied for 3 years. Residue determinations, chemically determined, showed DDT to be the most persistent with 36% remaining at the end of 3 years. BHC was next with 5% whereas guthion and malathion disappeared rapidly.

381. Rusoff, L. L., et al. Residues of Heptachlor Epoxide in Butterfat of Dairy Cows Grazing Pastures Treated with Granular Heptachlor. *J. Agr. Food Chem., 10:366 (1962).* As a result of slow release from the granules, soil residues of heptachlor from surface applications of granular heptachlor, at 14 lb/acre, increased from 0.42 μ g/g after 6 days to 0.81 μ g/g after 30 days.

382. Sheets, T. J. Persistence of Herbicides in Soils. *Proc. Western Weed Control Conf., 19:37 (1962).* A review is presented of herbicide persistence and accumulation in soil. Physical, chemical, and microbial interactions in the soil strongly influence the behavior and dissipation of herbicides in soil. Massive accumulation of presently employed herbicides appear rather remote.

383. Sheets, T. J., Crafts, A. S., and Drever, H. R. Influence of Soil Properties on the Phytotoxicities of the S-Triazine Herbicides. *J. Agr. Food Chem., 10:458 (1962).* Relative phytotoxicity of s-triazines applied to various soils was strongly correlated with the organic matter content of the soil. The relative persistence of the s-triazines used was simazine > atrazine > propazine > norazine.

384. Sijpisteijn, A., Kaslander, K. J., and Kerk, G. J. M. van der. On the Conversion of the Fungicide Sodium Dimethyl-Dithiocarbamate into its α-Amino Butyric Acid Derivative by Microorganisms. *Biochim. et Biophys. Acta, 62:587 (1962). Biol. Abstr., 41, 11985. Escherichia coli, Saccharomyces cerevisiae, Hansenula anomala,* as well as mycelial pellets of *Glomerella cingulata, Aspergillus niger,* and *Cladosporium cucumerinum* were able to effect the transformation. It is suggested that the dimethyldithiocarbamate is able to replace cysteine in its physiological coupling with homoserine and thus gives rise to the formation of the aminobutyric acid derivative of dimethyl-dithiocarbamate instead of to cystothionine, the amino butyric acid derivative of cysteine. The conversion appears to be reversible.

385. Spanis, W. C., Munnecke, D. E., and Solberg, R. A. Biological Breakdown of Two Organic Mercurial Fungicides. *Phytopathology, 52:455 (1962)* The biological degradation of semesan [30% 2-chloro-4-(hydroxymercuri) phenol] and panodrench 4 [0.6% cyano (methymercuri) guanidine] was investigated in an artificial soil mix.

Semesan was inactivated by isolates of *Penicillium* and *Aspergillus* species whereas panodrench 4 was inactivated by several *Bacillus* species.

386. Thiegs, B. J. Microbial Decomposition of Herbicides. *Down Earth, 18:7 (1962).* A brief review is given of the degradation of phenoxyalkyl carboxylic acids and chloro-substituted aliphatic acid herbicides by soil microorganisms. A pathway for chlorophenoxyacetic acid degradation is presented as well as some structural relationships that effect persistence. 31 references.

387. Upchurch, R. P., and Mason, D. D. The Influence of Soil Organic Matter on the Phytotoxicity of Herbicides. *Weeds, 10:9 (1962).* The initial phytotoxicity of 12 herbicides was inversely correlated to the organic matter content of the soil. A five-fold increase in herbicide dose was required for a five-fold increase in organic matter content.

388. Warner, K., and Fenderson, O. C. Effects of DDT Spraying for Forest Insects on Maine Trout Streams. *J. Wildlife Management, 26:86 (1962). W. P. A., 36, 1365.* DDT spraying to control spruce budworm in northern Maine caused considerable reduction in brook trout populations for several years.

389. Webb, H. J. Water Pollution Resulting from Agricultural Activities. *J. Am. Water Works Assoc., 54:83 (1962).* Incidents of water pollution are briefly reviewed. 10 references.

390. Wheatley, G. A., Hardman, J. A., and Strickland, A. H. Residues of Chlorinated Hydrocarbon Insecticides in Some Farm Soils in England. *Plant Pathol., 11:81 (1962).* Twenty-one agricultural fields were surveyed for the presence of chlorinated hydrocarbon insecticide residues. Dieldrin in concentrations of 0.01 to 0.41 ppm was detected in all fields known to be treated with aldrin whereas aldrin was detected in only four of these fields. Residues of DDT ranging from 0.01 to 0.9 ppm were found in 14 of the 21 fields. BHC seed dressings did not produce appreciable residues although crude BHC applied to one field in 1947 still persisted in sufficient concentration to taint potatoes grown in 1961.

391. Youngson, C. R., Baker, R. G., and Goring, C. A. I. Diffusion and Pest Control by Methyl Bromide and Chloropicrin Applied to Covered Soil. *J. Agr. Food Chem., 10:21 (1962).* Methyl bromide has a BP of 3.6°C at 760 mm Hg pressure, a vapor pressure of 1,380 mm Hg at 20°C, a water solubility of 16,000 ppm at 20°C, and an estimated diffusion coefficient of 0.097 in air at 20°C. Chloropicrin has a BP of 111.9, a vapor pressure of 20 mm Hg at 20°C, a water solubility of 1,950 ppm at 20°C, and an estimated diffusion coefficient in air at 20°C of 0.069.

392. Youngson, C. R., and Goring, C. A. I. Diffusion and Nematode Control by 1,2-Dibromoethane, 1,3-Dichloropropene, and 1,2-Dibromo-3-Chloropropane in Soil. *Soil Sci., 93:306 (1962).* The relative downward distribution was 1,3 dichloropropene >1,2-dibromoethane> 1,2-dibromo-3-chloropropane. Partial nematode control was obtained up to 18 inches below the injection point. The distribution is related to the organic matter content, porosity, and moisture content of the soil. The influence of these factors is dependent on the nematocidal, chemical, and physical properties of the compounds.

393. Yuen, Q. H., and Hilton, H. W. The Adsorption of Monuron and Diuron by Hawaiian Sugarcane Soils. *J. Agr. Food Chem., 10:386 (1962).* The equilibrium adsorption and desorption of monuron and diuron was investigated by shaking aqueous solutions of the herbicides with the soils. All soils show greater adsorptive capacity and bond strength for diuron than for monuron. Both chemicals exhibit normal isothermal adsorption equilibria, and bonding energy, measured as the resistance to desorption, was found to be directly related to adsorptive capacity.

1963

394. Acree, F., Jr., Beroza, M., and Bowman, M. C. Codistillation of DDT with Water. *J. Agr. Food Chem., 11:278 (1963).* The codistillation rate parallels the concentration from 1 to 100 ppb at 25°, 30°, and 35°C. With initial DDT concentrations of less than 35 ppb, more than 70% of the DDT was lost in a 24-hour period from pint glass jars (water loss of 9 to 13 g) held at 25°C. Significance of results to practical use of DDT is discussed.

395. Anon. Note on Phytotoxicity and Persistence of Polybutenes. *Can. J. Plant Sci., 43:416 (1963).* A long-term study at the Summerland Research Station of the Canadian Department of Agriculture showed that polybutene sprays were very persistent on the bark of apple and pear trees. The residues, expressed as mg/cm^2 on apple tree bark for 1, 2, 3, and 4 years of spraying were 0.6, 0.9, 1.3, and 1.7, respectively; for pear tree bark, 0.4, 0.9, 1.4, and 1.5, repsectively.

396. Ashton, F. M. Fate of Amitrole in Soil. *Weeds, 11:167 (1963).* Amitrole-5-C^{14} was rapidly degraded in unsterile soil but underwent only minor change in sterile soil. Although CO_2 was the principal metabolic product, 13 other products or intermediates were observed during degradation of amitrole. One or more of the metabolic products of amitrole are strongly adsorbed to soil and in this state appear resistent to further degradation.

397. Berck, B. Explorations in Fumigant Research. *Chemistry in Can., 15:36, 40 (1963).* A fumigant is defined as a compound that acts in the gas or vapor phase. Factors influencing fumigant efficiency are classified as nature of the fumigant, dosage applied, vapor pressure, temperature, diffusion, sorption, and relative susceptibility of pests. Some complex interactions of fumigant mixtures are improved migration of methyl bromide and ethylene dibromide when mixed with carbon tetrachloride; increased adsorption of chloropicrin, acrylonitrile, and ethylene dibromide with increasing moisture content up to 20%; and preferential adsorption of ethylene dibromide by wheat from a methyl bromide-ethylene dibromide mixture.

398. Brady, U. E., Jr., and Arthur, B. W. Biological and Chemical Properties of Dimethoate and Related Derivatives. *J. Econ. Entomol., 56:477 (1963).* Radioactive dimethoate was rapidly hydrolyzed in alkali, pH 11. About 87% of the dimethoate was degraded to water soluble materials in 2 hours. At the end of the 2-hour exposure, > 97% of the chloroform-solubles was dimethoate. The composition of the water soluble degradation products was des-methyl dimethoate, 49.3%;O,O-dimethyl phosphorothioic acid, 38.2%; carboxy derivative, 9.5%; andO,O-dimethyl phosphorodithioic acid, < 0.1%.

399. Breidenbach, A. W., and Lichtenberg, J. J. DDT and Dieldrin in Rivers: A Report of the National Water Quality Network. *Science, 141:899 (1963).* The insecticides DDT or dieldrin were identified in 38 samples from 10 rivers during the period May through December 1962. DDT was detected in nine rivers whereas dieldrin was detected in only one.

400. Bridges, W. R., Kallman, B. J., and Andrews, A. K. Persistence of DDT and Its Metabolites in a Farm Pond. *Trans. Am. Fisheries Soc., 92:421 (1963).* The persistence and distribution of DDT residues were determined over a 16-month period after treatment with a concentration of 0.02 mg/l in June 1961. Residues in the water were nondetectable after 3 weeks. The concentration in the upper 2 inches of bottom mud samples was inconsistent, but reached a maximum of several ppm after a few days and declined slowly to the pretreatment concentration after 8 weeks. The concentration in the pond vegetation reached 30.7 ppm 1/2 hour after treatment and then declined until the vegetation died out completely about 2 months after treatment. New vegetation in the next season contained pretreatment levels of DDT. Fish accumulated 3 to 4 ppm of DDT and metabolities within 1 month after treatment.

401. Bridges, W. R., and Sanders, H. O. Diffusion of Herbicides Through Plastic Film. *Progressive Fish-Culturist, 25:213 (1963).* A 3-amino-1,2,4-triazole herbicide and six chlorophenoxyacetic acid herbicides diffused readily through a 0.003-inch polyethylene film.

A bioassay procedure was used for detection of herbicides. In a quantitative aqueous solution test with Esteron 99 (propylene glycol butyl ether esters of 2,4-dichlorophenoxyacetic acid) exterior and interior concentrations were equal after 96 hours. Other tests showed that saran is ineffective for chlorophenoxyacetic acid herbicides, but clear polyvinyl chloride prevented diffusion of Esteron 99 and Am Chem's 2,4,5-TP [butoxyethanol ester of 2-(2,4,5-trichlorophenoxy) propionic acid].

402. Buchanan, G. A., and Rogers, E. G. Role of Temperature in the Inactivation of Some S-Triazine Herbicides. *Proc. Southern Weed Control Conf., 16:393 (1963). C. A., 59, 6917g.* Under field conditions bioassay with oats and soybeans indicated that simazine, atrazine, and ipazine were inactivated in less than 7 weeks in summer, but they were not inactivated in winter when the mean temperature was below 30°C. Atratone was active after 7 weeks in all seasons. In a 9-week laboratory study, the degradation rate of simazine, ipazine, and atrazine increased with temperature up to 45°C.

403. Buescher, C. A., Dougherty, J. H., and Skrinde, R. T. Chemical Oxidation of Selected Organic Pesticides. Presented at the 36th Water Pollution Control Federation Conference, October 7-11, 1963, Seattle, Washington (mimeo 27 pp). Studies completed to date indicate lindane, dieldrin, and aldrin concentrations in aqueous solution are readily decreased by ozonation. Aeration decreased aldrin and dieldrin, but not lindane concentrations. Permanganate attacked lindane and aldrin. Peroxide had no measurable effects on lindane and aldrin.

404. Burnside, O. C., Wicks, G. A., and Fenster, C. R. The Effect of Rainfall and Soil Type on the Disappearance of 2,3,6-TBA. *Weeds, 11:45 (1963). C. A., 58, 1067d.* 2,3,6-trichlorobenzoic acid (TBA) leaches readily into the soil profile. Loss of TBA from the surface soil by volatilization may result when reduced soil moisture coupled with high summer air temperatures produce high soil temperature.

405. Castelfranco, P., Oppenheim, A., and Yamaguchi, S. Riboflavin-Mediated Photodecomposition of Amitrole in Relation to Chlorosis. *Weeds, 11:111 (1963).* Riboflavin in dilute phosphate buffer solution caused photochemical breakdown of amitrole.

406. Day, B. C., Jordan, L. S., and Hendrixson, R. T. Herbicidal Properties of Low-Volatile Esters of Dalapon. *Weeds, 11:128 (1963).* The relative volatilities of five dalapon formulations from open surfaces at 38°C are acid, 180 lb/acre/hr; propyleneglycol bis ester, 27.2 lb/acre/hr; diethylene glycol bis ester, 1.6 lb/acre/hr; dipropyleneglycol bis ester, 0.83 lb/acre/hr; and triethyleneglycol bis ester, 0.61 lb/acre/hr.

407. Day, B. E., Jordan, L. S., and Russell, R. C. Persistence of Dalapon Residues in California Soils. *Soil Sci., 95:326 (1963).* Persistence ranged from complete disappearance in less than 2 weeks to 66% remaining after 8 weeks. The high degree of variability and randomness of the disappearance rate with respect to soil series, texture, cation exchange, total organic matter, and geographical source is common for processes associated with the metabolic mechanisms of a heterogeneous microbial population.

408. **Deming, J. M.** Determination of Volatility Losses of C^{14} -CDAA From Soil Surfaces. *Weeds, 11:91 (1963).* Suspension counting with a liquid scintillation spectrometer was adapted to determining volatilization of CDAA. The temperature dependence of volatilization was strongly influenced by moisture content. Increasing moisture content accelerated CDAA volatilization. For example, losses after 24 hours at 70°F were about 25 and 70%, respectively, for 60 and 98% relative humidity. The mechanism appears to involve competition between water and CDAA for adsorption sites although it cannot be differentiated from codistillation. Increasing organic matter content of soil increases the resistance of CDAA to volatilization.

409. **Ebeling, W.** Analysis of the Basic Processes Involved in the Deposition, Degradation, Persistence, and Effectiveness of Pesticides. *Residue Reviews, 3:35 (1963).* A comprehensive discussion is presented of the factors influencing the behavior and fate of a pesticide from the time of application to the disappearance of detectable residues from plants. Soil residues are discussed briefly. 423 references.

410. **Elliot, J. M., and Mountain, W. B.** The Influence of Spring and Fall Application of Nematocides on *Pratylenchus penetrans* and Quality of Flue-Cured Tobacco Grown With Various Forms of Nitrogen. *Can. J. Soil Sci., 43:18 (1963).* These experiments indicate that fall application of D-D and telone (1,3-dichloropropene and related chlorinated C_3 hydrocarbons) inhibit the nitrification of ammonium nitrogen applied to rye straw in the following spring.

411. **Faust, S. D., and Aly, O. M.** Evaluation of the Solubilities of the Calcium and Magnesium Salts of 2,4-Dichlorophenoxyacetic Acid (2,4-D). *J. Chem. Eng. Data, 8:413 (1963). C. A., 59, 9251 b.* The water solubility (distilled) of Ca 2,4-D and Mg 2,4-D were 9.05×10^{-3} M and 2.51×10^{-2} M, respectively. The activity solubility product constants were 1.096×10^{-6} and 1.55×10^{-5}, respectively.

412. **Freed, V. H., and Montgomery, M. L.** The Metabolism of Herbicides by Plants and Soils. *Residue Reviews, 3:1 (1963).* Metabolism by soil microorganisms, translocation into plants, and metabolism in plants are reviewed extensively. Compounds or compound types discussed include phenoxyallkylcarboxylic acids, symmetrical triazines, substituted carbamates, chloroaliphatic acids, 3-amino-1,2,4-triazole, and maleic hydrazide. 115 references.

413. Funderburk, H. H., and Lawrence, J. M. A Sensitive Method for Determination of Low Concentrations of Diquat and Paraquat. *Nature, 199:1011 (1963).* Two herbicides, 1,1'-ethylene-2,2'bipyridylium dichloride (diquat) and 1,1'-dimethyl-4,4'bipyridylium dichloride (paraquat), were determined by a bioassay procedure with the aquatic weed, duckweed, as the test material. Maximum sensitivity obtained with this method is 0.0005 ppm for diquat and 0.00075 ppm for paraquat. The method has been used to determine residues of diquat and paraquat in water collected from treated ponds and streams, as well as to detect the presence of these herbicides in the expressed cell sap from submersed aquatic weeds.

414. Geissbuehler, H., Hasebach, C., and Aebi, H. The Fate of N' (4-Chlorophenoxyphenyl) - N,N-Dimethylurea (C-1983) in Soils and Plants. I. Adsorption and Leaching into Different Soils. *Weed Res., 3:140 (1963). C. A., 59, 14508h.* The adsorption of C-1983 (I) and N-butyl N' (3,4-dichlorophenyl)-N methylurea (II) on soils is presented in terms of the isothermal Freundlich relations. K (concentration of compound adsorbed in equilibrium with a 1 ppm solution) values on sandy loam, clay loam, and humus soil were 14, 40, and 110, respectively, for (I) and 6.3, 21, and 60, respectively, for (II). Leaching studies with soil columns showed 80, 90, and 95% of (I) in the surface 1 cm of sandy loam, clay loam, and humus soil, respectively. Only a trace of (I) was found in the leachate equivalent of 200 mm of rainfall. (II) was less tightly adsorbed and after 200 mm of simulated rainfall the maximum concentration of (II) was at the 5- to 7.5-cm level in the sandy loam column.

415. Goring, C. A. I. Theory and Principles of Soil Fumigation. *Advances in Pest Control Res., 5:47 (1962).* Considerable emphasis is placed on basic principles, mathematical theory, and methods of application. The factors of air space, moisture, texture, organic matter, and temperature, which control movement in soil, are discussed independently. 311 references.

416. Hadaway, A. B., and Barlow, F. The Residual Action of Two Organophosphorus Compounds and a Carbamate on Dried Muds. *Bull. World Health Organization, 28:69 (1963).* Laboratory experiments indicate that malathion and fenthion (organophosphates) and U. C. 10854 (3 isopropylphenyl N-methyl carbamate) are readily adsorbed by dried muds. The reversible surface adsorption equilibrium is observably influenced by relative humidity.

417. Hilton, H. W., and Yuen, Q. H. Adsorption of Several Pre-Emergence Herbicides by Hawaiian Sugar Cane Soils. *J. Agr. Food Chem., 11:230 (1963).* Relative adsorption was pentachlorophenol > linuron > diuron > simazine > monuron > atrazine. The quantitative adsorption is primarily a function of easily oxidized organic matter content and carbon content from cane leaf burning although the mineral fraction plays a minor role.

418. **Holly, K., and Roberts, H. A.** Persistence of Phytotoxic Residues of Triazine Herbicides in Soil. *Weed Res., 3:1 (1963). Biol. Abstr., 44, 12428.* A bioassay procedure that employs shoot growth of Italian ryegrass is described. This method was used to compare persistence of simazine, propazine, prometone, and monuron in 3 soil types in 3 different years. A 2 lb/acre application of simazine was 80% dissipated in 7 to 27 weeks depending on the year. Prometone was the most persistent triazine tested.

419. **Jensen, H. L.** Sulphamic Acid as a Nitrogen Source for Micro-Organisms. *J. Appl. Bacteriol., 26:253 (1963).* Strains of *Aureobasidum (Pullularia) pullulans, Aphalosporium acremonium,* and two unidentified species of *Achromobacter* and *Flavobacterium* used sulphamic acid (sodium salt) as a source of nitrogen. This ability appears to be uncommon and pure culture studies with *A. pullulans* showed a long induction period before rapid growth. Both the fungi and bacteria converted the sulfur of the sulphamate to sulfate in approximately equimolar proportion to the amount of nitrogen assimilated.

420. **Jones, B. R., and Moyle, J. B.** Populations of Plankton Animals and Residual Chlorinated Hydrocarbons in Soils of Six Minnesota Ponds Treated for Control of Mosquito Larvae. *Trans. Am. Fisheries Soc., 92:211 (1963).* Bottom soil samples to a depth of about 2 inches were taken from six ponds that had received a total of 2.0 to 2.9 lbs/acre of DDT from 1958 to 1960. DDT in the soil samples ranged from 1.3 to 25.5 ppm (dry weight basis). Heptachlor epoxide was found in the soil samples from two ponds and an unidentified chlorinated hydrocarbon in samples from one pond.

421. **Jurinak, J. J., and Inovye, T. S.** Analyses of Ethylene Dibromide in Soils by Gas Chromatography. *Soil Sci. Soc. Amer. Proc., 27:602 (1963).* Decomposition of EDB in water is slight whereas 46 to 90% was decomposed in a clay soil in a period of 68 days. The greater decomposition was observed in soil with relatively greater moisture content.

422. **Kaufman, D. D., Kearney, P. C., and Sheets, T. J.** Simazine: Degradation by Soil Microorganisms. *Science, 142:405 (1963).* A soil fungus, *Aspergillus fumigatus* Fres., is effective in the degradation of the herbicide 2-chloro-4,6-bis (ethylamino)-s-triazine (simazine). The degradation of both ring-and chain-labeled (C^{14}) simazine was observed in an unamended and an amended (sucrose) basal medium. A loss of C^{14} occurred in all culture solutions containing ether ring- or chain-labeled simazine, but the decrease in activity observed was greater with chain-labeled than with ring-labeled simazine. Chromatographic evidence indicates that *A. fumigatus* may possess a degradation mechanism unlike that occurring in corn plants.

423. Kozlowski, T. T., and Kuntz, J. E. Effects of Simazine, Atrazine, Propazine, and EPTAM on Growth and Development of Pine Seedlings. *Soil Sci., 95:164 (1963).* Bioassay indicated that 2, 4, or 8 inches of water applied to the surface of Plainfield sand did not leach simazine or propazine below the surface inch of soil. Atrazine moved downward from the first inch more readily than simazine or propazine.

424. Lichtenstein, E. P., Schulz, K. R., and Cowley, G. T. Inhibition of the Conversion of Aldrin to Dieldrin in Soils with Methylenedioxyphenyl Synergists. *J. Econ. Entomol., 56:485 (1963).* Several methylenedioxyphenyl synergists effectively blocked the conversion of aldrin to dieldrin in soil for a period of at least 4 months. Increasing synergist concentrations from 100 to 2,500 ppm produced greater relative blockage of the aldrin to dieldrin conversion. Increasing synergist concentrations from 100 to 2,500 ppm also increased the total soil residue by as much as 50% at the end of the 4 month test period.

425. Macgregor, A. N. The Decomposition of Dichloropropionate by Soil Micro-Organisms. *J. Gen. Microbiol., 30:497 (1963).* Columns of air-dried soil were perfused with a mineral salt solution containing dalapon. Degradation of dalapon started after about 10 days, and the concentration of dalapon in the perfusate was minimal in 15 to 17 days. Soil columns previously exposed to dalapon reduced the perfusate concentration to the minimal level in 4 to 5 days. Numerous microorganisms capable of degrading dalapon were isolated from soils.

426. Martin, J. P. Influence of Pesticide Residues on Soil Microbiological and Chemical Properties. *Residue Rev., 4:96 (1963).* Considerable evidence is cited to show that commonly used herbicides are readily attacked by soil microorganisms whereas the chlorinated hydrocarbon insecticides appear to be highly resistant to microbial attack. The changes in the soil microflora such as a sharp reduction in nitrifiers that may follow the application of fungicides and fumigants are also covered. In general the concentrations of insecticides and herbicides used do not cause significant reductions in the soil microflora. Pesticides may influence soluble plant nutrient supplies directly or indirectly through their influence on the soil microflora. 206 references.

427. Martin, J. P., Baines, R. C., and Page, A. L. Observations on the Occasional Temporary Growth Inhibitions of Citrus Seedlings Following Heat or Fumigation Treatment of Soil. *Soil Sci., 95:175 (1963).* Relative persistence of several fumigants is indicated by growth inhibition of sweet orange seedlings after soil fumigation.

428. Menzer, R. E., and Ditman, L. P. Effect of Environmental Factors on Phosphamidon Degradation. *J. Agr. Food Chem., 11:170 (1963).* Increasing temperature from 60° to 90°F increased the rate of degradation of phosphamidon spray residues on snap beans and potatoes.

Increasing day length from 12 to 23 hours had no effect. Approximate half lives were 1.5 and 2.5 days under these experimental conditions.

429. **Miller, P. M., and Waggoner, P. E.** Interaction of Plastic Mulch, Pesticides, and Fungi in the Control of Soil-Borne Nematodes. *Plant Soil, 18:45 (1963).* A fungicide (pentachloronitrobenzene) inhibited organisms predaceous on a meadow nematode.

430. **Onley, J. H., Storherr, R. W., and Culver, A. J., Jr.** An Oregon Cranberry Bog Study for 3 Amino-1,2,4-Triazole Residues, 1961-1962. *J. Assoc. Offic. Agr. Chemists, 46:996 (1963).* Residues in soil, fruit, and bushes were evaluated monthly following 4 and 8 lb/acre spray applications of 3 amino-1,2,4-triazole to two cranberry bogs. The colorimetric analysis employed included at least one metabolite of 3 amino-1,2,4-triazole. Initial soil residues were higher for the 8 lb/acre rate but declined to nondetectable limits after about 12 months, as did the 4 lb/acre rate. Residues in the bushes and fruit ranged from nondetectable to 1.6 ppm for the bushes and from 0.18 to 0.36 ppm in the fruit after 12 months.

431. **Proctor, M. H.** Some Steps in the Degradation of Naphthalene Acetic Acid. *Plant Soil, 18:338 (1963).* A *Pseudomonad* capable of using naphthalene acetic acid as sole carbon source was isolated from soil. The route of decomposition proceeded through d-naphthal, salicylic acid, and catechol. Similarities of this route to the breakdown of indole acetic acid are indicated. 18 references.

432. **Robeck, G. G., Cohen, J. M., Sayers, W. T., and Woodward, R. L.** Degradation of ABS and Other Organics in Unsaturated Soils. *J. Water Pollution Control Federation, 35:1225 (1963).* The herbicides 2,4-D and 2,4,5-T were degraded by the microflora existing in sand lysimeters that had been receiving septic tank effluent for a substantial period before introduction of the herbicides. 2,4-D was degraded within 2 weeks of steady operation while 2,4,5-T was not degraded until after a lag of approximately 1 month.

433. **Roberts, R. J.** Availability of Dieldrin to Adult *Blissus leucopterus* and Larval *Cyclocephala immaculata* in Treated Sand, Loam, and Muck Soils. *J. Econ. Entomol., 56:781 (1963).* Relative dosage rates of dieldrin to produce comparable mortalities in sand, loam, and muck soils were approximately 1, 70, and 600, respectively. The dosage rate increase was attributed to increasing physical adsorption capacity for the three soils.

434. **Sheets, T. J.** Photochemical Alteration and Inactivation of Amiben. *Weeds, 11:186 (1963).* Spectrophotometric and chemical analyses indicated that photodecomposition of amiben (3-amino-2,5-dichlorobenzoic acid) in water solution occurred rapidly during exposure to sunlight or light from fluorescent sun lamps. After 6 hours'

exposure, only 50% of the amiben remained in an aqueous solution of 10^{3} molar initial concentration. Photochemical alteration of amiben was slightly faster at pH 3.2, the pH of aqueous amiben, than at pH 7 or 10. Several degradation products were separated by paper chromatography. Dry amiben exposed under similar conditions underwent a slow but definite photochemical alteration. Loss of herbicidal activity from 10^{3} molar aqueous solutions approximated the disappearance of amiben determined colorimetrically.

435. **Sheets, T. J., and Shaw, W. C.** Herbicidal Properties and Persistence in Soils of S-Triazines. *Weeds, 11:15 (1963).* Evaluation of residual phytotoxicity of 29 s-triazines indicates that methoxy s-triazines are more persistent than corresponding chloro s-triazines. Several methylmercapto-derivatives also appeared quite persistent.

436. **Turnipseed, S. G., and Reed, J. K.** The Rate of Leaching of Dieldrin from Attapulgite Clay Granules. *J. Econ. Entomol., 56:410 (1963).* Bioassay was employed to determine dieldrin released from 10% dieldrin in 30/40 mesh attapulgite clay granules. Formulation of granules was with dieldrin in xylene, a heavy aromatic solvent, or a mixture of diethylene glycol and water. Dieldrin assay of the leachate initially and at 1, 2, 4, 8, 16, and 32 days showed a large reduction in rate of release between the initial 200 ml of leachate and the sample after 1 day. Leaching rate after the first 200 ml was relatively constant to the 32d day. Undried xylene formulated granules allowed a much higher initial release of dieldrin.

437. **Westlake, W. E.** Pesticides. *Anal. Chem., 35:105R (1963).* A review is made of analytical methods. 90 references.

PESTICIDE NAME INDEX

Common Name	Chemical Formula	Reference Numbers
AC 5727	m-isopropylphenyl N-methylcarbamate	291
acaricides		203
acrylonitrile		396
agrosan	(78.4% ClO_3^-)	331
alanap-1	N-1-naphthylphthamic acid	57,176
aldrin	1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-1,4-endo,exo-5,8-dimethanonaphthalene	72,83,87,90,93,116,129,137,155,162,186,194,195,199,200,235,237,238,239,241,259,267,283,284,290,295,306,328,332,369,390,403,424
allyl alcohol		233,302,329,330
American Cyanamid 12008	O,O-diethyl-S-(isopropylthio) methyl phosphorodithioate	184
American Chemical 2,4,5-TP	butoxyethanol ester of 2-(2,4,5-trichlorophenoxy) propionic acid	401
American Cyanamid Nematocide 18133	O,O-diethyl-O-2,pyrazinyl phosphorothioate	336
amiben	3-amino-2,5-dichlorobenzoic acid	376,434
3-amino-1,2,4-triazole		see amitrole
amitrole	3-amino-1,2,4-triazole	149,213,226,269,322,325,333,336,379,396,401,405,430
anforstan	(68.1% ClO_3^-)	331
aramite	2-(p-tert-butylphenoxy)-1-methylethyl-2-chloroethyl sulfite	335
arsenic		42,112,141,286,352
atratone	2-methoxy-4-ethylamino-6-isopropylamino-s-triazine	305
atrazine	2-chloro-4-ethylamino-6-isopropylamino-s-triazine	265,275,305,356,362,383,402,417,423

Common Name	Chemical Formula	Reference Numbers
Bayer 22408	O,O-diethyl-O-naphthalimido phosphorothioate	336
Bayer 22684	O-methyl-O-(2-chloroethyl)-O-(2-dichlorovinyl) phosphate	336
Bayer 25141	O,O-diethyl-O-p-(methylsulfinyl)phenyl phosphorothioate	336
Bayer 29493	O,O-dimethyl-O-(4-methylthio-m-tolyl) phosphorothioate	291,336
Bentox	1,2,3,4,5,6-hexachlorocyclohexane	see BHC
BHC	1,2,3,4,5,6-hexachlorocyclohexane	12,16,17,21,23,25, 27,28,30,31,33,37, 41,42,45,50,61,72, 82,83,84,86,87,92, 94,99,100,103, 108,112,117,120, 128,137,139,140, 145,153,162,165, 185,206,237,272, 294,335,350,374, 380,390
C-1983	N-4-chlorophenoxyphenyl-N-N-dimethyl-urea	414
camphor		206
captan	N-trichloromethylmercapto-4-cyclohexene-1,2-dicarboximide	127,205,220
carbamate compounds		63,81,95,264,285, 289,320,375,412
CDAA	alpha-chloro-N-N-diallylacetamide	213,249,270,408
CDEC	2-chloroallyl diethyldithiocarbamate	249,270
chlorate		331,346
chlorazine	2-chloro-4,6-bis-(diethylamino) s-triazine	275
chlordane	1,2,3,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methanoindene	25,28,30,45,73,83, 87,90,93,112,137, 140,153,155,162, 237,241,259,286, 295,306
chlorinated hydrocarbon insecticides		222,224,235,237, 239,248

Common Name	Chemical Formula	Reference Numbers
chlorophenols		20,60,85,136,154, 357
chloropicrin	trichloronitromethane	391,396
chloro-substituted aliphatic acids		164
chloro-substituted benzoic acids		246
CIPC	isopropyl-N-(3-chlorophenyl) carbamate	57,198,221,225, 264
CMU	3-(p-chlorophenyl)-1,1-dimethylurea	see monuron
co-ral	O,O-diethyl-O-3-chloro-4-methyl-2-oxo-2H-1-benzopyran-7-yl phosphorothioate	336
crag herbicide	sodium 2,4-dichlorophenoxyethyl sulfate	338
2,4-D	2,4-dichlorophenoxyacetic acid	5,6,7,14,15,32,36, 38,39,43,49,57,60, 64,102,105,107, 130,143,147,152, 154,172,173,212, 213,242,254,260, 273,281,299,335, 341,346,353,401, 412,432
2,4-D esters		39,47,57,98,226, 401
2,4-D salts		6,13,15,22,36,49, 51,98,107,130,411
dalapon	2,2-dichloropropionic acid	138,213,240,264, 276,277,321,335, 406,407,425
DBN	2,6-dichlorobenzonitrile	279,307,334
D-D	mixture of 1,3-dichloropropene-1, and 1,2-dichloropropane	87,219,410
DDE	2,2-bis-(p-chlorophenyl)-1,1-dichloroethylene	10,400

Common Name	Chemical Formula	Reference Numbers
DDT	1,1,1-trichloro-2,2-bis(p-chlorophenyl) ethane	1,2,3,8,9,10,11,21, 24,26,44,45,62,67, 69,70,71,73,79,83, 84,86,87,91,93, 103,109,110,112, 114,115,124,126, 137,140,145,151, 153,162,170,183, 185,196,200,206, 235,239,241,243, 247,252,261,267, 278,283,286,288, 290,294,318,326, 327,332,344,347, 380,388,390,394, 399,400,420,
DDVP	O,O-dimethyl-2,2-dichloro vinyl phosphate	371
dexon	sodium p-dimethyl-aminobenzene diazo sulfonate	364
diazinon	O,O-diethyl-O-(2-isopropyl-4-methyl-6-pyrimidinyl) phosphorothioate	74,336
1,2-dibromo-3-chloropropane		166,197,392
1,2-dibromoethane		52,75,158,163, 167,168,188,197, 367,392,397,421
dichlone	2,3-dichloro-1,4-napthoquinone	207,220
1,3-dichloropropene		52,392,410
dieldrin	1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo,exo-4,8-dimethanonaphthalene	72,73,83,87,90,93, 103,116,129,137, 153,155,162,179, 186,195,199,237, 238,241,243,259, 294,295,297,298, 306,328,369,390, 399,403,413,424, 433,436
dilan	mixture of 2-nitro-1,1-bis (p-chlorophenyl) propane and 2-nitro-1,1-bis (p-chlorophenyl) butane (1 to 2 ratio)	162

Common Name	Chemical Formula	Reference Numbers
dimefox	tetramethyl phosphorodiamidic fluoride	184
dimethoate	O,O-dimethyl S(N-methylcarbamoyl-methyl) phosphorodithioate	336,377,398
dipterex	O,O-dimethyl-1-hydroxy-2,2,2-trichloroethylphosphonate	335
diquat	1,1-ethylene-2,2-dipyridylium dibromide	262,319,413
di-syston	O,O-diethyl S-2-(ethylthio) ethyl phosphoro dithioate	336,377
diuron	3-(3,4-dichlorophenyl)-1,1-dimethylurea	118,175,211,214, 251,305,335,348, 349,393,417
DMU	3-(3,4-dichlorophenyl)-1-methyl urea	175,211
DNBP	2 sec-butyl-4,6-dinitrophenol	see DNOSBP
DNOC	2-methyl-4,6-dinitrophenol	11,126,136,272
DNOSBP	2 sec-butyl-4,6-dinitrophenol	88,134,190
Dow ET-57	O,O-dimethyl-O-(2,4,5-trichloro-phenyl) phosphorothioate	184
Dowfume MC-2	(chloropicrin 2% methylbromide 98%)	197
Dowfume W-85	1,2-dibromoethane (83%)	see 1,2 dibromo-ethane
dyrene	2,4-dichloro-6-(o-chloroanilo) triazine	220
E600	O,O-diethyl-O-p-nitrophenyl phosphate	53,56,66
E605	diethyl-p-nitrophenyl thiophosphate	19
EDB	1,2dibromoethane	see 1,2dibromo-ethane
endothal	disodium 3,6-endoxohexahydro-phthalate	317
endrin	1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4 endo, endo-5,8-dimethanonaphthalene	129,137,155,162, 241,278,290,295, 311
EPN	O-ethyl-O-p-nitrophenyl phenylphosphonothioate	83,87
EPTC	ethyl di-n-propylthiolcarbamate	218,249,320,322

Common Name	Chemical Formula	Reference Numbers
esteron-99	propylene glycol butyl ether esters of 2,4-dichlorophenoxyacetic acid	see 2,4-D esters
ethion EC-4	O,O,O,O'-tetraethyl-S,S' methylene-bis-phosphorodithioate	289,336
ethylene dibromide	1,2-dibromoethane	see 1,2 dibromoethane
ethyl guthion	S-(3,4-dihydro-4-oxo-1,2,3-benzotriazin-3-ylmethyl)O,O-diethyl phosphorodithioate	336
fenuron	3-phenyl-1,1-dimethylurea	175,211,264,305
ferbam	ferric dimethyl dithiocarbamate	76,205
fumigants		122,204,231,309, 397,415,427
fungicides		126,204,205,234, 309,337
gamma BHC	gamma isomer of 1,2,3,4,5,6 hexachlorcyclohexane	11,45,48,68,73,92, 117,123
gammexane	gamma isomer of 1,2,3,4,5,6 hexachlorocyclohexane	4,114,124,185,187
GC 3582	O,O-diethyl-1-(2,5-dichlorophenyl)-2,2-dichlorovinyl phosphate	336
GC 3583	O,O-diethyl-1-(2,5-dichlorophenyl)-2-chlorovinyl phosphate	336
guthion	S-(3,4-dihydro-4-oxo-1,2,3-benzotriazine-3-ylmethyl)O,O-dimethyl phosphorodithioate	336,380
heptachlor	1,4,5,6,7,8,8-heptachloro-3a,4,5,5a-tetrahydro-4,7-endo-methanoindene	90,93,116,137, 144,155,162,194, 217,239,241,258, 259,282,284,292, 295,328,369,372, 381
heptachlor epoxide		194,237,292,328, 381,420
herbicides		65,85,96,97,126, 161,208,211,213, 215,221,226,232, 234,246,249,251, 257,300,303,305, 309,319,324,343, 359,360,382,386, 387,412

Common Name	Chemical Formula	Reference Numbers
hexachlorane	1,2,3,4,5,6 hexachlorocyclohexane	see BHC
hexachlorocyclohexane	1,2,3,4,5,6-hexachlorocyclohexane	see BHC
hexyclan	1,2,3,4,5,6-hexachlorocyclohexane	see BHC
insecticides		55,78,110,126, 135,191,199,200, 224,228,229,234, 236,241,243,245, 247,252,253,255, 257,259,268,363, 389
ipazine	2-chloro-4-isopropylamino-6-diethylamino-s-triazine	402
isodrin	1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-1,4-endo, endo-5,8-dimethanonaphthalene	129,162
IPC	isopropyl-N-phenylcarbamate	5,18,57,221
karmex-W	3-(p-chlorophenyl)-1,1-dimethyl urea	see monuron
lindane	gamma isomer of 1,2,3,4,5,6-hexachlorocyclohexane	41,73,103,106, 108,116,137,155, 200,230,235,238, 239,241,247,278, 283,295,328,403
linuron	3(3,4-dichlorophenyl)-1-methoxyl-1-methylurea	417
malathion	O,O-dimethyl-S-(1,2-dicarbethoxy ethyl)-phosphorodithioate	250,291,328,342, 380,416
maleic hydrazide	1,2-dihydropyidazine-3,6-dione	80,169,273,412
MCPA	2-methyl-4-chlorophenoxyacetic acid	5,126,147,154, 172,212,273
methoxychlor	1,1,1-trichloro-2,2-bis (p-methoxyphenyl) ethane	58,73,162,183, 295
methyl bromide	bromoethane	391,397
methyl trithion	O,O-dimethyl-S-(p-chlorophenylthio) methyl phosphorodithioate	336
monuron	3-p-chlorophenyl-1,1-dimethylurea	77,81,104,111, 118,133,134,146, 148,175,181,209, 211,215,264,305, 348,393,417,418

Common Name	Chemical Formula	Reference Numbers
mylone	3,5-dimethyltetrahydro-1,3,5,2H-thiadiazine-2-thione	314
nabam	disodium ethylene bisdithiocarbamate	63,201,205,314, 337
neburon	1-n-butyl-3(3,4-dichlorophenyl)-1-methylurea	305
nematume	1,2-dibromoethane	see 1,2-dibromoethane
nemagon	1,2-dibromo-3-chloropropane	see 1,2-dibromo-3-chloropropane
nematocides		59,122,197,245
OMU	cyclo-octyl-dimethyl-urea	256
organophosphates		29,126,132,184, 229,250,252,289, 336,365,377,416
organic sulfur compounds		42,127,160
OS-1836	diethyl-2-chlorovinylphosphate	377
panodrench 4	cyano methylmercuri quanidine	385
paraquat	1,1'-dimethyl-4,4'-bipyridylium dichloride	413
parathion	O,O-diethyl-O-p-nitrophenyl phosphorothioate	28,29,30,42,45,46, 53,58,83,87,89, 112,137,153,159, 178,184,193,202, 210,229,286,291, 304,328,336,373
PBA	(polybenzoic acid)	246
PCA	4-amino-5-chloro-1-phenyl-6-pyridazone	358
pentachloronitrobenzene		429
pentachlorophenol		34,54,417
pesticides		121,125,162,189, 191,204,222,252, 255,257,274,280, 301,308,309,351, 365,378,409,426, 437
phorate	O,O-diethyl-S-(ethylthio) methyl phosphorodiethoate	184,228,271,328, 336,377

Common Name	Chemical Formula	Reference Numbers
phosdrin	dimethyl-1-carbomethoxy-1-propen-2-yl phosphate	228
phosphamidon	2-chloro-2-diethylcarbamoly-1-methylvinyl dimethyl phosphate	428
phygon	2,3-dichloro-1,4-naphthoquinone	207
polybutene		395
prometone	2-methoxy-4,6-bis-isopropylamino-s-triazine	265,362,418
propazine	2-chloro-4,6-bis-isopropylamino-s-triazine	265,362,383,418,423
pyrethrins		79
pryolan	1 phenyl-3-methylpyrimidyl-6-dimethylcarbamate	74
rhothane	1,1-dichloro-2,2 bis (parachlorophenyl) ethane	see TDE
Rohm and Haas CR-305	2,2'-thiobis (4-chlorophenol)	127
ronnel	O,O-dimethyl-O-(2,4,5-trichlorophenyl) phosphorothioate	336
rotenone		177,263,310,315,316
schradan	octamethyl pyrophosphoramide	184
semesan	2-chloro-4-(hydroxymercuri) phenol	205,385
sevin	1-naphthyl-N-methylcarbamate	328
Shell Develop. SD 4402		290
simazine	2-chloro-4,6 bis (ethylamino)-s-triazine	213,265,266,293,305,312,313,339,340,345,354,356,361,362,383,402,417,418,421,423
SMDC	sodium N-methyl dithiocarbamate	366
substituted urea herbicides		175,211,223,251,305,414
sulphamic acid		419
2,4,5-T	2,4,5-trichlorophenoxyacetic acid	47,64,98,143,154,172,226,299,353,401,432
TBA	trichlorobenzoic acid	143,213,227,246,264,355,404

Common Name	Chemical Formula	Reference Numbers
TCA	sodium trichloroacetate	35,164,213,232, 264,276,277
TDE	1,1-dichloro-2,2-bis (p-chlorophenyl) ethane	45,162,278
telone	1,3-dichloropropene and related chlorinated C_3 hydrocarbons	410
thimet	O,O-diethyl-S-(ethylthiomethyl) phosphorodithioate	see phorate
thiodan	6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-6,9-methano-2,4,3-benzodioxathiepin-3-oxide	289
thiram	tetramethylthiuram disulfide	101
toxaphene	chlorinated camphene (67 to 69% chlorine)	25,28,40,45,58,72, 83,84,87,90,155, 162,241,263,294, 296,316,368
s-triazines		131,156,206,275, 293,305,361,362, 383,402,412,423, 435
trithion	S-[p-(chlorophenylthio) methyl] O,O-diethyl phosphorodithioate	287,336
U.C. 10854	3-isopropylphenyl N-methyl carbamate	416
vapam	sodium N-methyl dithiocarbamate dihydrate	171
wegerein	(79.5% ClO_3^-)	331
zineb	zinc ethylenebisdithiocarbamate	375
ziram	zinc dimethyl dithiocarbamate	375

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